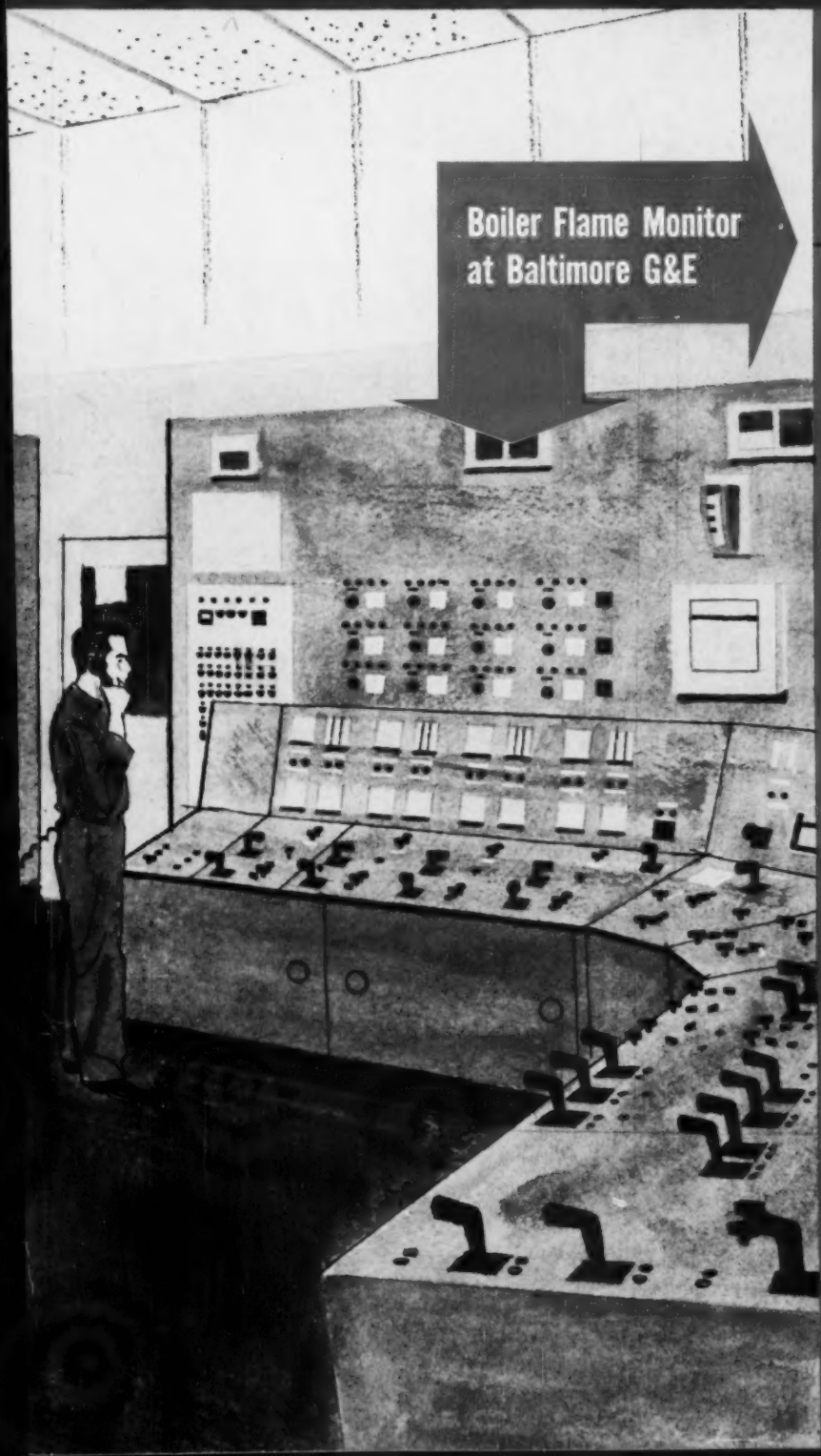
The Electrical Industry's Weekly Magazine February 15, 1960

Electrical World

Price One Dollar

A McGraw-Hill Publication

First of six reports for 1960



Eum

Starts on p 99

- Visible record improves substation maintenance at PS of Indiana
- New tractor handles coal pile for Minnesota P&L

Departments:

Construction p 120
Operation & Testing p 126
Maintenance & Repair p 133
Safety p 144
Stores & Shops p 140

ALLIS-CHALMERS ANNOUNCES

ALL-NEW JFR REGULATOR

Lower, lighter up to 40%!
For use anywhere in your system

1. Electrical resettable drag hands on position indicator, reset from push button in control panel.
2. Oil-sight gauge in tank wall reveals oil level at all times.
3. Horizontal *external* by-pass arrester offers high-voltage protection.
4. Easily read, six-digit, direct-reading counter records JFR's life history to one million operations.

. . . And 19 more customer benefits.

Where to get more JFR regulator facts fast—Bulletin 21B7977E.

Call, write or wire...

A-1218

ALLIS-CHALMERS

"Originators of 5/8% Step Regulators"

Electrical World

Vol. 153, No. 7 FEBRUARY 15, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

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Buyers' Meet Focuses on Prices, Values

Purchasing executive questions terms, but lauds escalation change. Sellers press to trim cyclical buying.....p 64

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Sealed Transformers Proved by Experience

W. A. Sumner, Westinghouse Electric Corp

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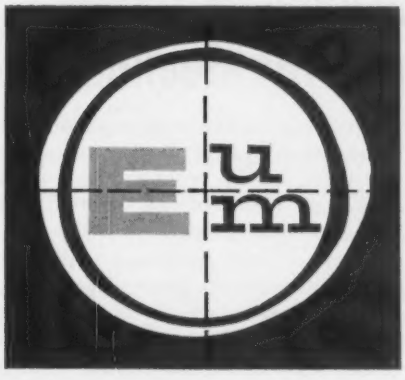

Electric Utility Methods

Use of proven tools, equipment and methods for construction, operation, and maintenance of electric utility systems is presented in the first of six reports for 1960. Over 20 methods are covered in this 52-page report.

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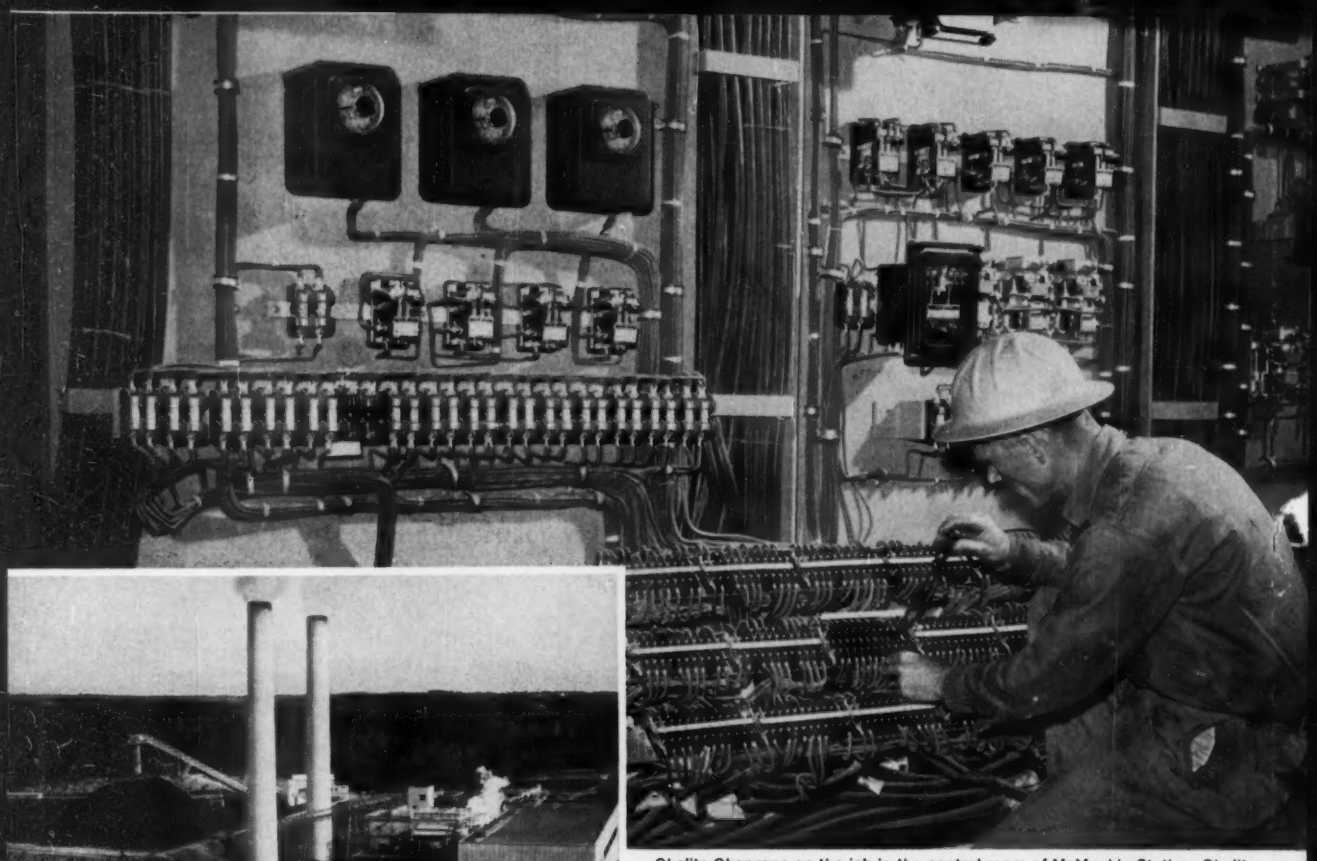
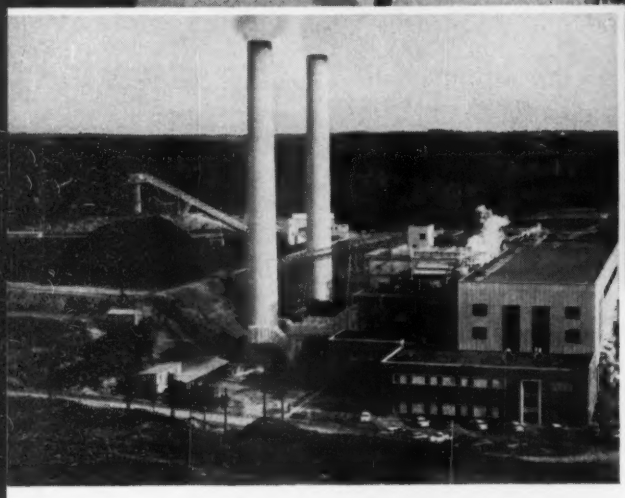


Okolite-Okoprene on the job in the control room of McMeekin Station. Okolite-Okoprene 600-volt and 5000-volt cables were used for all power, control and lighting circuits for both units of the station, assuring long, dependable service.



Modern coal-handling facilities at South Carolina Electric and Gas Company's new McMeekin Station—one of the most efficient and economical steam electric generating stations in the world. The new station, producing 275,000 kilowatts of power, uses only 15 cubic feet of space per kilowatt.

Over a Million Feet of Okolite-Okoprene in South Carolina Electric's new McMeekin Station

More than a million feet of 600-volt and 5000-volt Okolite-Okoprene cables are installed in South Carolina Electric & Gas Company's new McMeekin Station, engineered by Gilbert Associates, Inc. of Reading, Pa., installed by T. D. McClure, Jr. Co. of Atlanta, Ga., formerly Miller Electric Co. of Carolina.

Okolite-Okoprene cables had previously shown satisfactory service records in power, control and lighting circuits at South Carolina Electric's second largest steam electric generating facility, Urquhart Station.

The McMeekin installation—one of the world's most efficient and economical generating stations, providing 275,000 kilowatts of power while using only 15 cubic feet of space per kilowatt—uses a variety of Okolite-Okoprene cables. Multi-conductor control and power cables were used almost exclusively throughout the plant and switchyard and to connect the coal handling facility and adjacent Hydro Plant. Multi-conductor constructions were used to increase mechanical protection since most cables were installed in common in-the-floor or in-the-ground raceways covered by steel plates or concrete slabs.

In projects where maximum dependability and proved service life are required, Okolite-Okoprene is consistently recognized as the best cable for the job. Its long life and high dielectric strength . . . its resistance to corona cutting, moisture, heat, chemicals and mechanical damage, make it the most reliable cable on the market. For the full story on Okolite-Okoprene, write for Bulletin EW-1085. The Okonite Company, Subsidiary of Kennecott Copper Corporation, Passaic, N. J.

where there's electrical power . . . there's **OKONITE CABLE**

7229

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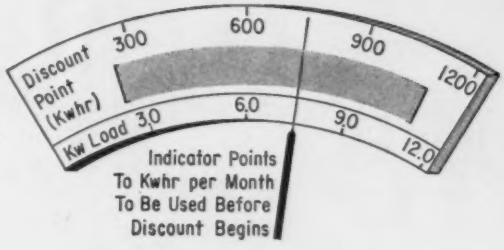
LETTERS

Why Not a "Discount" Meter?

To the Editor:

Sangamo Electric Co's recent ad "Why Call It Demand?" seems to have drawn a lot of fire. The name obviously should be changed so why not give it a name that has sales appeal? One of the most popular sales gimmicks today is "discount" and that might be a good approach.

Many electric companies have rate schedules that do not have a demand charge of so much per kw. Rather, they have a clause something like "The 4¢ per kwhr bracket shall be increased 100 kwhr per kw of demand." Then the rate might be reduced 2¢ per kwhr. If a customer's demand is 5 kw, this rate says in effect, "after you use 500 kwhr per month, you get a 50% discount." The meter could read in terms of discount point rather than kw demand. Thus it would be called a "discount meter" and might look something like this:



It is not unusual for a customer to believe he could get a better rate for his electric service if he could get the demand meter removed. Many customers do not realize that the word "demand" actually means electrical demand on the power system rather than an extra demand for more money. Customers have been known to circulate petitions and call meetings to seek legislative action to force the removal of demand meters. But a crusade to have "discount meters" removed wouldn't get very far. The customer would feel that the meter was there to benefit rather than penalize him.

Most complaints about demand meters come from small commercial customers who are always getting discounts of one kind or another. The "discount meter" should be "right down their alley."

Joe S. Moak
Mississippi Power & Light Co,
Brookhaven, Miss.

▶ We cordially invite your comments, criticisms, and ideas. Address your correspondence to "Letters Editor," Electrical World, 330 W. 42nd St., New York 36, N. Y. Letters may be edited to fit space requirements.

150,000

90,000

135,000

217,000

300,000

125,000

160,000

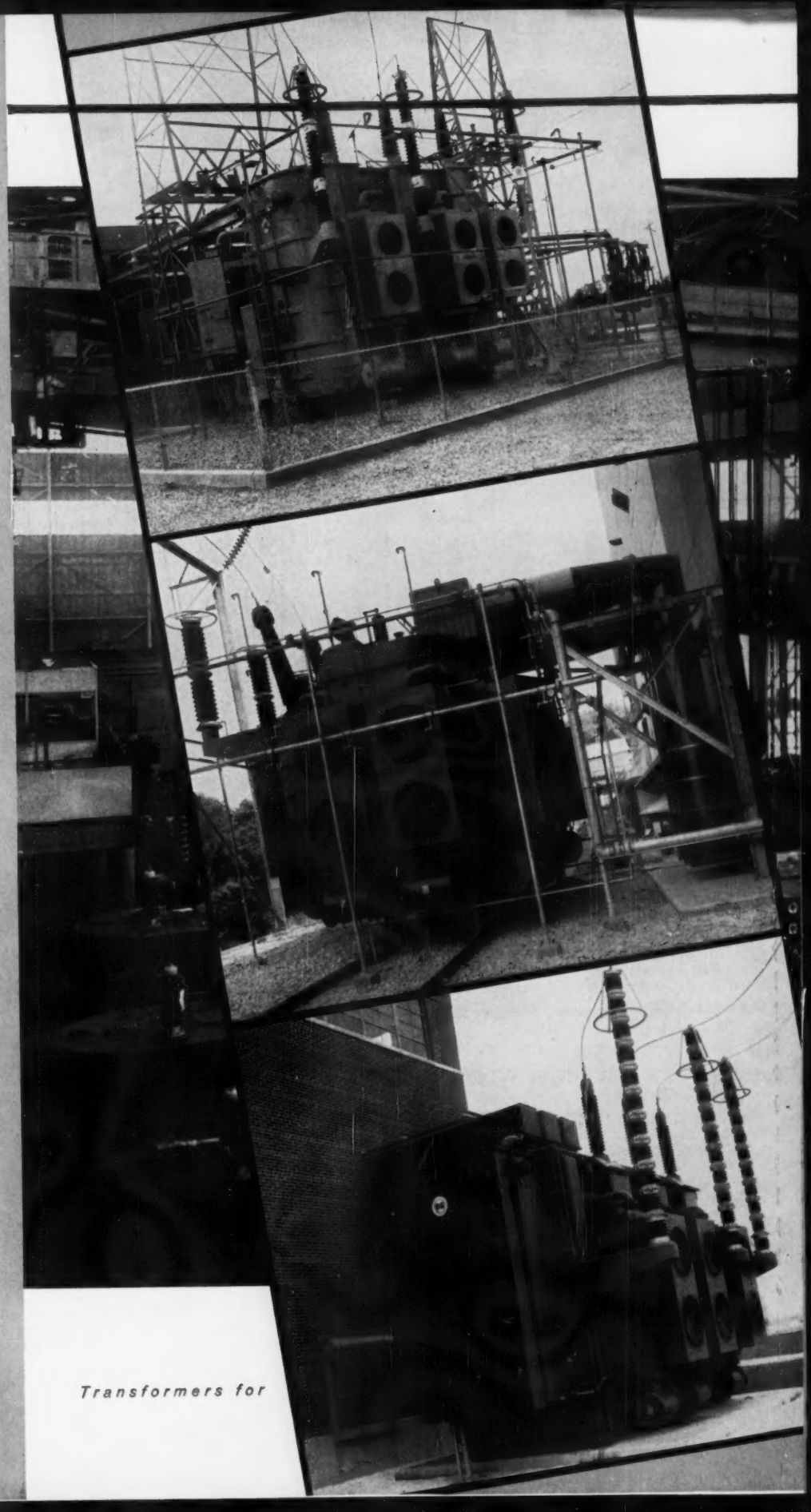
96,000

75,000

200,000

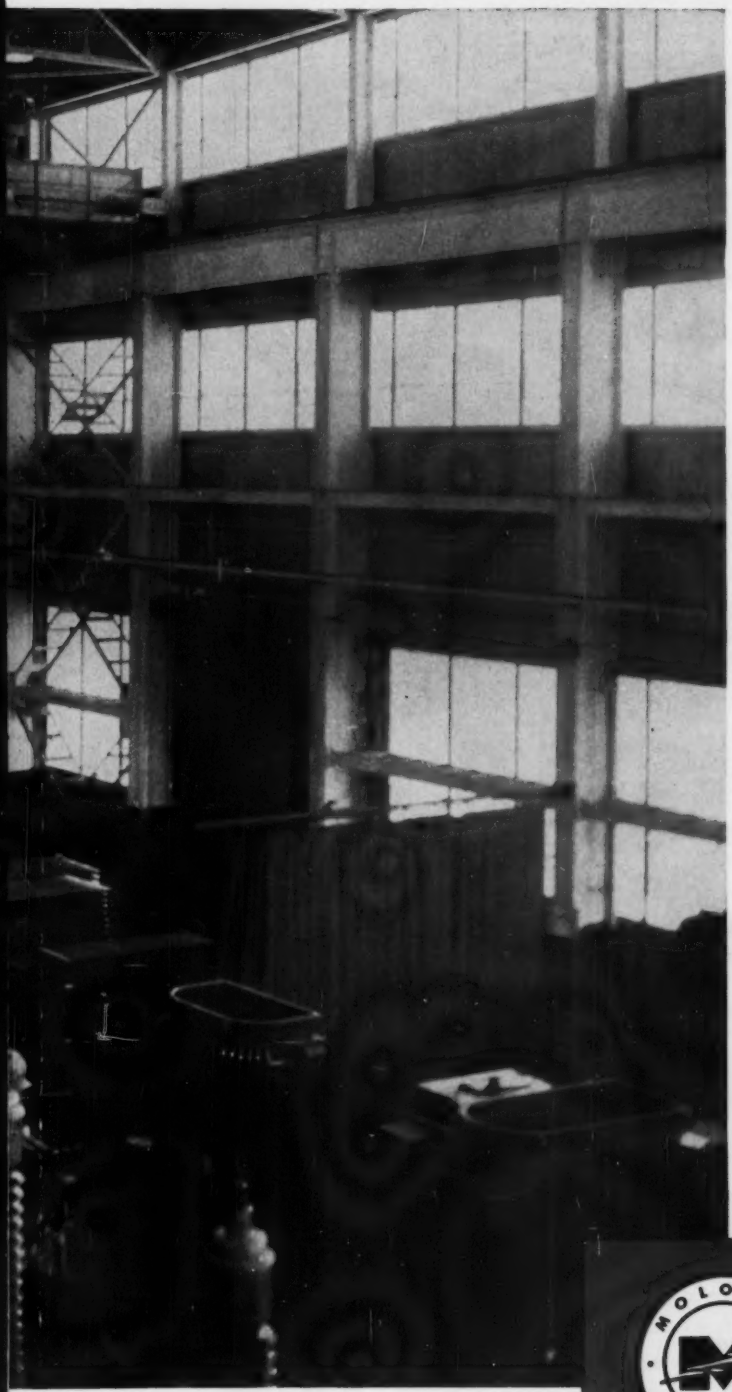
100,000

230,000



Transformers for

—THE NUMBER YOU PICK . . .



depends on carefully calculated system requirements of present and future loads. So too, must the manufacturer of power transformers be chosen, carefully . . . and with an eye to the future.

To this end, careful consideration of Moloney Electric Company's qualifications will reveal these facts:

- Sixty-three years experience in designing transformers of all types and sizes.
- Modern, extensive facilities with the capacity to produce transformers of any size or rating.
- Unexcelled product operating records.
- Continuous research and development to improve transformer design and manufacture.

This ability to design and manufacture efficient, dependable transformers of any rating is a carefully calculated result of Moloney planning and preparation.

When "the number you pick" is determined, be sure that your requirements are adequately fulfilled, specify Moloney Transformers . . . All Along The Line.

ME59-8

MOLONEY ELECTRIC

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TORONTO, ONT., CAN.

SALES OFFICES
IN ALL PRINCIPAL CITIES

Utilities, Industry, and Electronic Applications

TWO FABLES FOR OUR TIME

A Gray Squirrel

lived in a forest of great oak trees. The Squirrel dined sumptuously on the delicious acorns that grew high in the oaks.

But one day a visiting squirrel told of another forest, quite far away, where the trees were not nearly so tall, and where the acorns were much easier to reach.

The gray Squirrel promptly set out for those easy pickings in the distant forest. They were tasty indeed.

On his third trip he met a red fox.

End of story.

MORAL: Smart squirrels know it's wiser in the long run to gather acorns in their own back yard.

A Farmer owned a sleek Jersey cow. He milked the cow every day, and his children drank every drop.

One day a neighbor said to him: "Charlie, my cows give more milk than I need. I'll sell you all the milk you need very cheaply, and you won't have to bother with milking any more."

The Farmer had a nose for bargains and he accepted the deal. And instead of milking twice a day, he had more time to watch TV.

Then one day his neighbor's wife had triplets and they no longer had any milk to spare.

The Farmer tried to milk old, faithful Bossy, but —alas—she had dried up.

MORAL: If you don't milk the cow you have, some day you may be awfully thirsty.

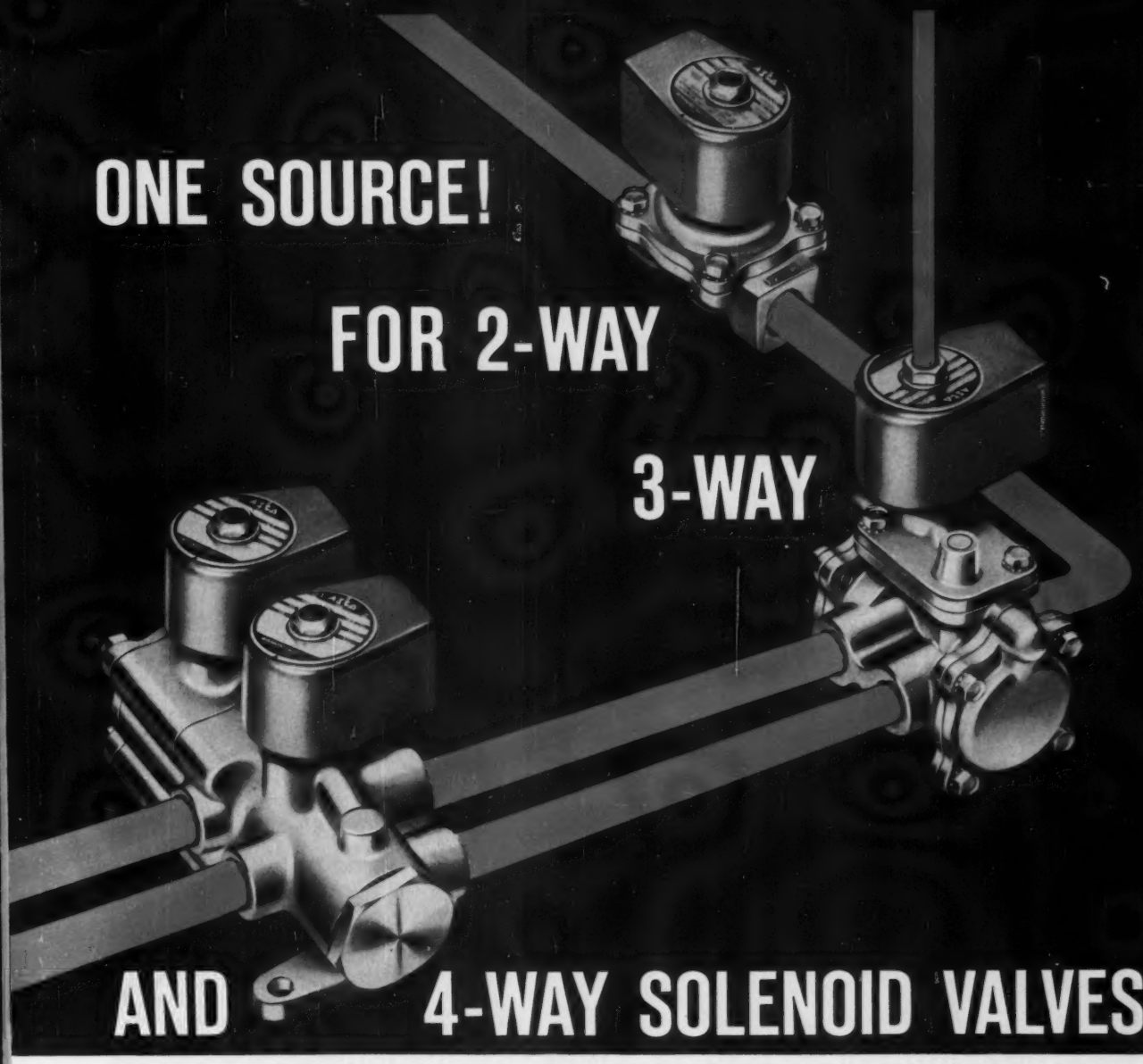
WE make excellent steel transmission towers. We've made them for years, and we will continue to make them just as long as you'll buy them.

You can't get better towers, or better service, or a more reliable source of supply, anywhere.

We welcome your inquiries.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BETHLEHEM STEEL



When you discuss solenoid valve requirements with an ASCO engineer, you benefit from the design and development experience of half a century. The ASCO specialist can recommend the right valve for your needs because ASCO pioneering has brought about the thousands of types of solenoid valves now available:

Two-way valves in pipe sizes from ⅛" to 8"—for temperatures from -350°F to 600°F—for pressures to 5000 p.s.i.

Three-way valves in pipe sizes from ⅛" to 2"—for temperatures from -350°F to 600°F—for pressures to 1000 p.s.i.

Four-way valves in pipe sizes from ¼" to 1½"—for temperatures from -65°F to 212°F—for pressures to 750 p.s.i.—poppet or slide type.

And ASCO can supply you with standard, explosion-proof or water tight enclosures—Class A and Class H coils—a wide range of body materials including cast iron, brass, bronze and stainless steel. Or trade on ASCO experience and have one of our engineers call.

New! Catalog No. 202 covers the ASCO line of Solenoid Valves. Write for your copy today.

For Immediate Delivery...

World's largest stock of Solenoid Valves. A complete Solenoid Valve Stock List will be sent to you with your copy of Catalog No. 202.

Whatever the crucial factor in your flow control applications—reliability, compactness, high cycling rate—there is an ASCO valve that meets your need.

ASCO Valves

ASCO®

Automatic Switch Co. 50-F HANOVER RD., FLORHAM PARK, N. J., FRONTIER 7-4600

AUTOMATIC TRANSFER SWITCHES • SOLENOID VALVES • ELECTROMAGNETIC CONTROL

Another Engineering Achievement

FEDERAL PACIFIC PACKAGE POWER CENTERS

Available from 45 to 500 kva at 5 kv.
From 45 to 300 kva at 15 kv.

give central stations twice the kva—in half the space

These compact, factory assembled power centers let you take advantage of economical primary distribution, lower installation costs, and reduced voltage drop on your system.

UNIT RESPONSIBILITY WITH THE COMPLETE LINE OF FEDERAL PACIFIC COMPONENTS:

PRIMARY SECTION—Type IS Load Break Air Interrupter Switches.

TRANSFORMER SECTION—Dry Type Transformer—Class B Insulation—especially designed and mounted for whisper-quiet operation.

DISTRIBUTION SECTION—Rotary Handle Circuit Breakers through 800 a.—QMQB Fusible Switches through 1200 a....meet your distribution requirements.

Plus all these features:

COMPACT SIZE Up to 50% more kva per square foot of floor space. Typical 500 kva unit is only 78" high, 77" long, 42" deep.

FASTER INSTALLATION Only one pre-engineered, factory-assembled unit to handle.

SIMPLIFIED MAINTENANCE All operating parts accessible from the front.

DESIGNED FOR SAFETY All high voltage parts including rotary tap changers are mounted in an interlocked compartment.

Write for Bulletin 2300, Federal Pacific Electric Company, General Offices: Dept. 404, Newark 1, New Jersey—The Best in Electrical Control, Distribution and Power Equipment.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**
Affiliated with Cornell-Dubilier Electric Corporation

The Electrical Week

FUTURE NEWS ▶ **Will Peace River Project be knocked into a cocked hat?** The recent announcement by British Columbia Electric that it has purchased huge coal deposits in the interior of the province on which it plans to build a $200-million, 2.6-million-hp plant has interested observers wondering how this new development will affect the situation.

LATE NEWS ▶ **Washington Wire** . . . House Interior Subcommittee expects to vote on Burns Creek Authorization Bill after final hearings this week. Utility and local witnesses will be heard . . . City of Los Angeles files license application with FPC (against Arizona Power Authority) for $243-million Bridge Canyon Dam on Colorado River . . . Union Electric asks FPC to determine whether it needs license for its proposed 350,000-kw Taum Sauk pumped-storage project . . . Pacific P&L files license application with FPC for 77,000-kw Eden Ridge hydro project . . . Senate unanimously confirms Brooks Hayes for nine-year term as TVA director.

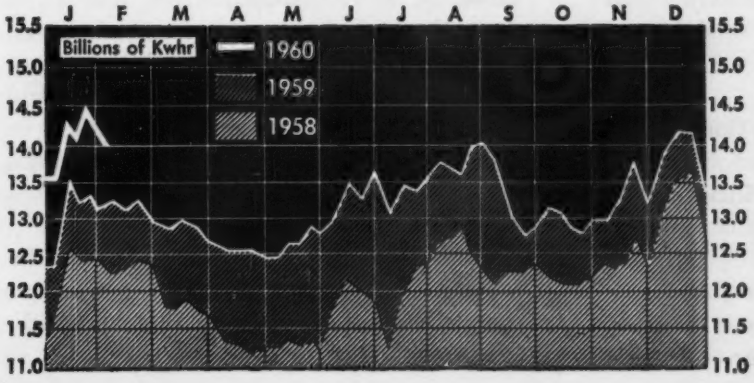
N. Y. Gov Rockefeller wants utilities to pay for cost of PSC. Budget for the agency for fiscal year beginning April 1 is $4.2 million. No details were given on how utilities would share the cost.

Columbus & Southern Ohio completes negotiations with 18 communities to up rates $550,000 a year gross, $225,000 net.

Philadelphia grand jury is expanding its pricing investigation and is issuing new subpoenas to cover more products made by electrical manufacturers. Presentments due this month, therefore, can be looked upon as an "interim report" of the grand jury.

Management changes . . . American Electric Power elects all three of its exec vps—Harold Turner, D. C. Cook and H. A. Kammer—to the board . . . Monongahela Power elects G. E. Vest and J. D. Gorman vps.

WEEKLY POWER OUTPUT—Up 6.1% (Week ending Feb. 6), Kwhr 14,097,000,000



Per Cent Change From Previous Year

	Jan. 23	Jan. 30	Feb. 6
Total U. S.	+ 8.4	+ 8.8	+ 6.1
New Eng.	+ 5.0	+ 5.4	+ 4.7
Mid. Atlan.....	+ 7.6	+ 6.5	+ 6.4
Cent. Ind.	+ 9.1	+ 9.1	+ 7.2
West Cent. ...	+ 4.4	+ 5.2	+ 2.4
Southeast	+ 7.7	+11.1	+ 4.5
South Cent. ...	+ 8.1	+ 9.1	+ 7.9
Rocky Mount ..	+ 9.1	+11.3	+ 3.5
Pacific			
NW	+13.1	+ 8.6	+ 5.7
SW	+11.7	+10.2	+ 9.6

Seasonally Adjusted Index 264.9

Week Ago 266.6 Year Ago 249.8

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **Buyers talked "pricing;" manufacturers talked "values"** at the Public Utility Buyers Group Conference in Atlanta. One purchasing executive lashed out at "abuses" in uniform pricing practices. Suppliers pointed way to additional economics (p 64) . . . ICC examiner says railroad freight rate cut is OK for coal going to East Coast utilities (p 67) . . . Vermont passes legislation permitting PSC to obtain Niagara energy for resale. Robert Moses says transmission distance is not economic (p 68) . . . Meanwhile, Moses charges that N. Y. State Power Authority is being frozen out of the A-plant business (p 69).

ENGINEERING ▶ **Distribution transformers** stand the test of time. A sampling of 150 sealed transformers in use on utility systems since 1941 revealed they are in excellent condition (p 71).

ELECTRIC UTILITY METHODS REPORT ▶ **Flame monitor assists operator** in starting and running Baltimore G&E's new station (p 112) . . . Visible record systems means better substation maintenance for PS of Indiana (p 114) . . . Tractor passes test of moving 600 tons of coal an hour for Minnesota P&L (p 116) . . . More methods detail new ideas in construction, operation, maintenance, safety, and stores, plus new equipment and manufacturers literature (p 99).

Politics and Public Power

GATHERING ATOM CLOUDS

Threatening clouds are gathering over the Congressional hearings beginning Feb. 16 on the state of the atom. And they may bring the Administration, the electrical manufacturers and the private utilities under a political storm started by the Democrats.

Nationally prominent figures have stated that after years of effort and a total federal spending of $25 billion, the U. S. nuclear power program is a flop.

But AEC Chairman John McCone, to occupy the hearings hot seat as lead-off witness, will react calmly to the new criticism.

In an EW interview, he said that economical A-power will be energetically pursued, and—what's more—achieved through an exact and resolute technical development program.

But before the Joint Committee on Atomic Energy, McCone is well aware that he'll have to do better than that. In the context in which the failure of the program will be charged, the committee will tell the reactor manufacturers to stop expecting too much in the way of quick profits. And they are expected to respond with the charge that AEC refuses to assume responsibility for the program's success, and that there has been a shrinkage of national objectives. The U. S. de-emphasized A-power, industry believes, because Britain lately has cut its efforts to capture the international reactor market and Russia has scaled down nuclear programs in its latest seven-year plan. Consequently, contraction of the reactor industry has resulted in manufacturers leaving the field.

Utilities will have also helped fashion the present crisis, Democrats are expected to charge, because of their refusal to buy costly reactor complexes at this time.

PROCUREMENT & PRODUCTS ▶ **"Soaring 60's" got off to a good start,** utility exec tells Public Utility Buyers Group . . . Illinois Power publishes purchasing policy manual (p 82) . . . EEI report shows 1959 was not a record year for makers of heavy electrical equipment (p 84) . . . S&C Electric unveils "Circuit-Switcher" (p 86) . . . Simplex Wire & Cable adds 500-kv, 25-ma dc cable test set to its research lab (p 87).

ELECTRICAL BUSINESS OUTLOOK ▶ **There's been a surprising amount of hidden growth** in our industrial economy since 1947, and the utility industry gets credit for about a third of it. That's what the "Fed's" statisticians discovered when they overhauled their Index of Industrial Production recently. Read about the utility contribution to the new index in this week's Management Newsletter beginning on **page 155.**

SELLING ▶ **Iowa Electric L&P sells 550 electric yard lights door-to-door (p 92).** Edison Electric Institute plans shorter, but more intensive Sales Conference this year **(p 96).**

NEXT WEEK ▶ **The engineering behind the coal-gas burning prototype turbine** going in at Ohio Power (EW Feb. 1, 1960, p 28) will be detailed in a four-page story by GE and AEP authors.

And there will be other voices in the chorus. Not only has ex-AEC Chairman David Lilienthal said that we have been oversold on A-power, but that the present program "is not to be taken seriously." Admiral Hyman Rickover thinks nuclear power is still 20 years away.

Rep Chet Holifield (D-Calif.), who will be the hearings principal interrogator, has pointed out that presently not one kilowatt of A-power is being generated in the U. S.—mostly because of Budget Bureau fiscal policies imposed upon technical programs. As for AEC's 10-year reactor program, Holifield recalls that the commission in '56 promised competitive A-power by 1960. Now, he says, it's time to put up or shut up.

McCone knows the difficulties he's in for in justifying the fiscal 1961 budget request of $2.7 billion, if as a result of the hearings, the argument that these huge expenditures are netting very little catches on in Congressional circles. Consequently, McCone will be doing some bargaining with Sen Clinton Anderson (D-N.M.), chairman of the Joint Committee.

With Anderson facing re-election, McCone has promised him a plum in the form of a government contract for the National Laboratory at Los Alamos. The idea is that McCone will relax momentarily his hold on the spending line if Anderson will help soften his colleagues' attacks on AEC's programs.

This can backfire, however. Bear in mind that Senate majority leader Lyndon Johnson has in this session asserted that Democratic Party's need for legislation to benefit the over-all welfare. And, this may well be the rein Democrats need to support once again a major Gore-Holifield type public power program.

Nuclear Notes

An experimental containment shell under test at Hennepin Power Station of Illinois Power Co, by Sargent and Lundy, was wrecked by explosion on Dec. 18. The blast occurred during the final in a series of tests of a pressure-suppression scheme for reducing the size of reactor containment shells. The scheme (EW, Nov. 9, p 52) provided for steam escaping from the reactor to be condensed by cold water in a jacket around the vessel. In the final test the simulated reactor had been purposely weakened so that it would give way as steam pressure increased. It ruptured as planned, but it appears that there was not sufficient heat absorption by the cold water, according to a report in Illinois Power Co's publication "Hi-Lines."

At Dresden Nuclear Power Station critical testing was resumed on Feb. 4. Control rod difficulties shut the reactor down on Nov. 6.

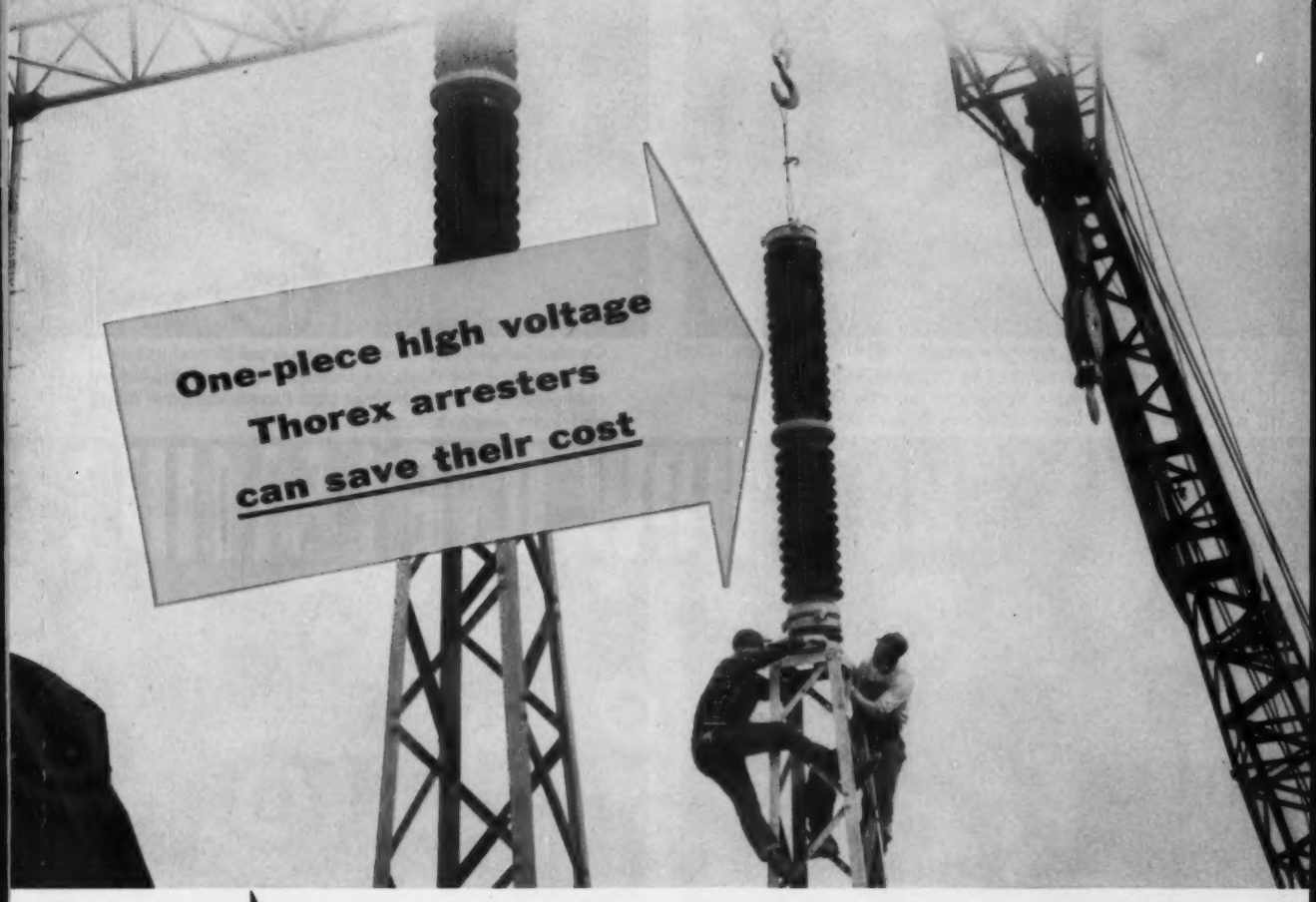
Construction is scheduled to begin this month on the Saxton, Pa., nuclear reactor which will supply steam to a conventional steam turbine in the Pennsylvania Electric Co's nearby Saxton Generating Station. The reactor is being built, for the Saxton Nuclear Experimental Corp, for research and development under sponsorship of Pennsylvania Electric Co, Metropolitan Edison Co, New Jersey Power & Light Co, and Jersey Central Power & Light Co.

AEC has scheduled a hearing for March 3 on the application of Yankee Atomic Electric Co for approval of technical specifications in the construction of a pressurized light-water-moderated and cooled reactor.

Briefs have been filed by the AEC and Power Reactor Development Co in support of a 1956 provisional construction permit issued for the Enrico Fermi fast-breeder reactor. Three AFL-CIO unions have asked the D.C. Court of Appeals to overturn the AEC decision. They claim that AEC violated its own regulations, and the Atomic Energy Act, in reaching merely conditional findings concerning reactor construction, as it may affect public safety. AEC and PRDC argue that, since the provisional permit isn't a final order, the unions haven't enough grounds on which to seek judicial review.

AEC has announced a policy covering disposal of radioactive waste. The Commission has determined that regional sites for permanent disposal of low-level packaged radioactive waste materials shall be established, as needed, on state or federal government-owned land. The AEC doesn't contemplate that ownership and control of the sites must necessarily be restricted to the federal government. State governments may wish to assume some responsibility in the establishment of control sites. Land requirements will not be large in any event. All such wastes generated between now and 1980, in the 16 states in the Northeast, could be disposed of in a 200 or 300-acre site.

Convenience pays off



This Thorex Dynagap lightning arrester for 345-kv service arrived on the job in *one piece*. It was lifted directly from the packing case to its pedestal. Two or three minutes -- for only a couple of men -- and it was installed!

Compare this to what used to be the installed cost of high voltage arresters. Labor, special structures, added station area, often equaled the original purchase price.

And, for this sound bargain in lightning arresters, you get an entirely new order of surge durability and equipment protection, plus complete immunity from the effects of surface contamination. Thorex Type MPR arresters of any voltage can be hot-washed by hose or spray systems.

For the best of performance and -- by far -- the best installed price, put Thorex arresters in your new stations.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

4922-H1

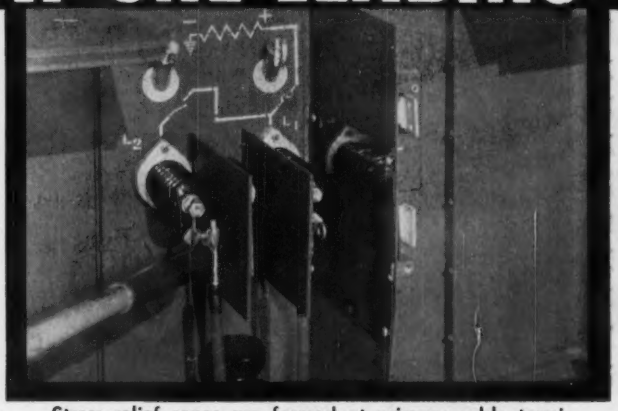
RT&E Terra-Trau

Area developer, by previous agreement with the utility, does trenching and pouring of concrete at his expense. Utility and developer cooperate in establishing final grade, so that uniform cable depth can be maintained.

Conduit bends for primary cable are positioned at transformer site. After ducts for both primary and secondary cable are laid, the trench at pad location is back-filled, and loose earth is tamped.

SHOW HOW ONE LEADING

When homes are ready for service, transformer is brought to pad location and bolted to the pad by means of the studs set in the concrete.



Stress relief cones are formed at primary cable terminations. Connections to transformer bushings are made by means of hot line clamps designed for either hand or hot stick operation.

UNDERGROUND DISTRIBUTION

Terra-Trau ready for service. All that remains to be done is the connection of customer-owned secondary and final landscaping, to be completed as shown in this illustration.

INSTALLATION PHOTOGRAPHS

Wooden form for transformer pad is constructed at transformer site and concrete is poured. Both of these jobs are the responsibility of the area developer.

Direct burial primary and secondary cable is laid in trench and terminations brought out at transformer site.

UTILITY HOLDS DOWN

Lineman demonstrates method of removing or inserting bayonet-type high voltage fuse or disconnect switch that is used when energizing or de-energizing the Terra-Tran.

Secondary connections are made to complete the installation. Terra-Tran's green finish blends in with surroundings.

SYSTEM COSTS

RT&E

ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

CORPORATION

WAUKESHA, WISCONSIN

PORTLAND, OREGON

DD

AI's extensive field laboratory is located in California's Santa Susana Mountains. *Woodcut by Edward Kysar.*

How can A.I. facilities help you plan a Nuclear Program?

In the picturesque Santa Susana mountains near Los Angeles, Atomics International has built an extensive field laboratory for research, engineering and testing in the nuclear sciences. Here, and at a headquarters complex in the valley below, men who pioneered the creative uses of atomic energy are applying their experience to develop advanced nuclear reactors and associated equipment.

Fourteen years of experience in developing various types of reactors for the Atomic Energy Commission and other organizations have given the men of Atomics International a collective background unparalleled in the industry. The facilities at their disposal are among the most sophisticated and extensive in the world.

Results of AI's work have been demonstrated in projects for the AEC which include the Organic Moderated Reactor Experiment at the National Reactor Testing Station in Idaho and the Sodium Reactor Experiment at the company's field laboratory. Additionally, AI built and is operating SNAP II, a 220 pound prototype reactor to produce three kilowatts of electricity for space vehicles.

Atomics International is also building large power reactors for electric utilities in Ohio and Nebraska under AEC programs. Studies are underway for other power reactors in the United States and Europe. Research reactors have been built by AI for Denmark, Germany, Italy, Japan, Puerto Rico and several sites in the United States.

For details contact: ATOMICS INTERNATIONAL, Canoga Park, California, U.S.A. Cable address: ATOMICS.

ATOMICS INTERNATIONAL

A DIVISION OF NORTH AMERICAN AVIATION, INC.

PIONEERS IN THE CREATIVE USE OF THE ATOM

Other offices in: Washington, D.C., U.S.A.; Geneva, Switzerland. Affiliated with: INTERATOM, Bensberg/Cologne, Federal Republic of Germany and DYNATOM, Paris, France.

Here's a low-cost guy you'll never have to replace...

Copperweld®

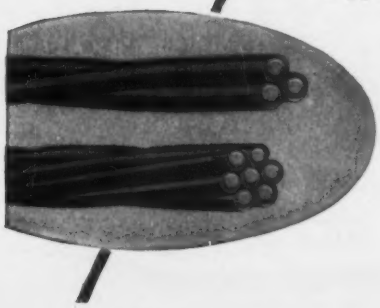
TYPE **M**™ STRAND

...gives you both strength and permanence

Here's an easy way to eliminate the trouble and expense caused by the failure of rust-weakened guys. Install Copperweld Type M Strand—it's your best buy for all guying purposes.

The rugged strength of Type M Strand is permanent because each wire is protected against corrosion by a thick cladding of pure copper molten-welded to the steel core. The copper cannot crack, flake or peel so there's no danger of corrosion even getting started.

You can count on dependable, maintenance-free support from Type M Guy Strand. Easy to install, it can be dead-ended by any of the conventional methods. Write today for complete engineering data.



COPPERWELD STEEL COMPANY

WIRE AND CABLE DIVISION *Glassport, Pa.*

For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

TYPE M STRAND LASTS AS LONG AS THE POLE IT SUPPORTS

LAPP...FIRST IN LINE POST AND STATION POST INSULATORS

1931 FIRST Line Post Insulator

1931 FIRST Station Post Insulator

1932 FIRST Clamp-Top Line Post

1933 FIRST High-Strength (4,000 lb.) Station Post

1934 FIRST radio-free 66 kv Line Post

1935 FIRST separable mounting studs for Line Post

1936 FIRST Line Posts used for armless transmission

1936 FIRST Station Post for distribution switches

1937 FIRST Extra-High-Strength (8,000 lb.) Station Post

1946 FIRST two-piece Station Posts

1950 FIRST 10,000 lb. Station Post

1954 FIRST Clamp-Top Line Post for horizontal mounting

1954 FIRST Line Post for 115 kv

1955 FIRST Distribution Posts

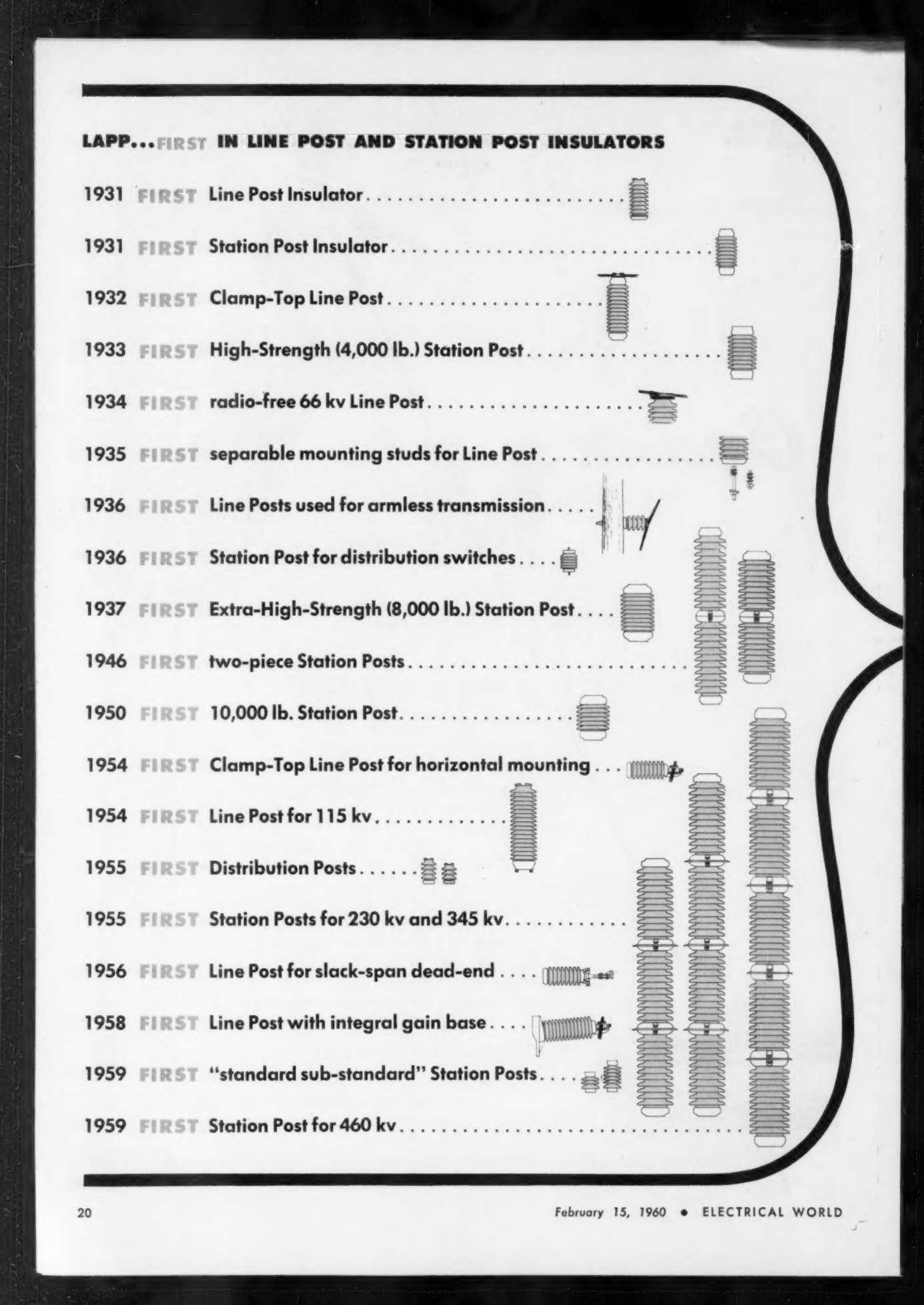
1955 FIRST Station Posts for 230 kv and 345 kv

1956 FIRST Line Post for slack-span dead-end

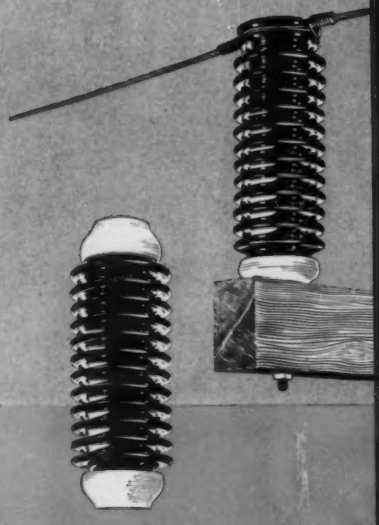
1958 FIRST Line Post with integral gain base

1959 FIRST "standard sub-standard" Station Posts

1959 FIRST Station Post for 460 kv



SUDDENLY OUR BABY'S GROWN UP!



It used to take courage and foresight to specify Lapp Line Post and Station Post Insulators... now it just takes a glance at the record.

You probably take Line Posts and Station Posts for granted. Hard not to, when records show them outperforming pin-type units spectacularly. But when Lapp first introduced its revolutionary idea, in 1931, conservative power companies took a wait-and-see attitude. They waited. Year after year they saw Lapp Posts serve without failure on lines and stations where replacements had been a problem. Finally they began standardizing on this better insulator design.

But it took years. And of course competition sniped away. Between times, they tried to copy Lapp's design, but without Lapp's patiently-acquired skills and techniques in ceramic manufacture. Now that Lapp Posts have been accepted, there is less sniping, more copying—endorsement of the fact that our baby has come of age.

If you're not yet using Line Posts and Station Posts, you ought to know how they cut maintenance and replacement costs. Your logical source is the company that pioneered, proved and perfected them—Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp Line Posts and Station Posts for many uses are shown in the new Lapp Catalog Eight. Write for your copy.

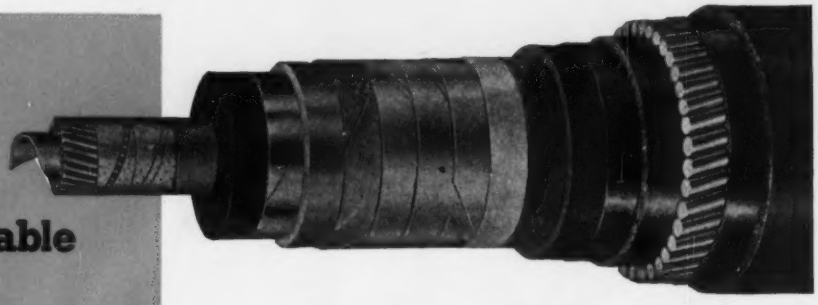
Lapp

experience

keeps BICC *in the lead*

Being the World's greatest cablemakers is not just a matter of size.
It's also, generally speaking, a case of knowing more than the other guy.
The experience gained from making BICC cables and accessories for every electrical purpose has helped us pioneer many developments in our field.

This 138 kV submarine cable had to be 16 miles long *–unjointed!*



The power link between the British Columbia mainland and Vancouver Island required more than 133 miles of 138kV single-conductor submarine cable, including seven 16 mile lengths — each without a single joint. Making such unjointed lengths of cable was considered to be 'impossible' in the electrical world. But BICC made and laid them with conspicuous success. Altogether some $10,000,000 of power cable contracts have been placed with BICC by the British Columbia Electric Company Ltd.

D.S.O. FOR ECONOMY

The Ductless Shaped-conductor Oil-filled cable is BICC's latest development in 33kV transmission. Dispensing with fillers and built-in ducts, it costs less than conventional cables of equal duty.

CABLES FOR THE FIRST NUCLEAR POWER STATION

BICC supplied cables and accessories for Calder Hall, England, the first nuclear power station in commercial operation. The cables include specially designed types resistant to intense radiation and heat, for operating the fuel charging and discharging grabs.

330,000 VOLT CABLE FOR KARIBA

The Kariba dam has been built on the Zambesi river to provide hydro-electric power for Central Africa.

Transmission equipment for this project was manufactured by BICC. Altogether orders for this company total some ten million dollars and include a specially designed 330,000 volt single-conductor oil-filled cable which connects the underground power house to the overhead transmission lines. This is the highest voltage cable ever installed in Africa.

BICC **the World's largest cablemakers**

BRITISH INSULATED CALLENDER'S CABLES LIMITED
Technical Representative in U.S.A., Arthur F. Coventry, 11 West 42nd Street, Suite 442, New York 36, N.Y.

¾ HOOK . . . preferred by linemen, makes it easier to engage the eye of the clamp to be removed. Extra-strong bronze ¾ hook seats deep in head casting to prevent twisting open. Note, too, how yellow color assures hi-visibility where it counts most . . . at the "business end" of the stick.

new!

KEARNEY

YELLOW FIBERGLAS CLAMPSTICK

...with enclosed mechanism...added safety features

NEW! **A shotgun stick you can always see . . . in any light . . . against any sky . . . in the beam of a spotlight.**

NEW! **Telltale yellow surface shows instantly if the stick is safety-clean.**

NEW! **Smooth-as-silk operation . . . fully enclosed operating rod and mechanism . . . ¾ hook . . . thumb latch.**

Kearney's new clampstick combines the lightness, ruggedness and high dielectric strength of a Fiberglas pole with a slick new mechanism . . . plus an important bonus . . . yellow color permanently molded-in for maximum visibility. Needs no costly refinishing.

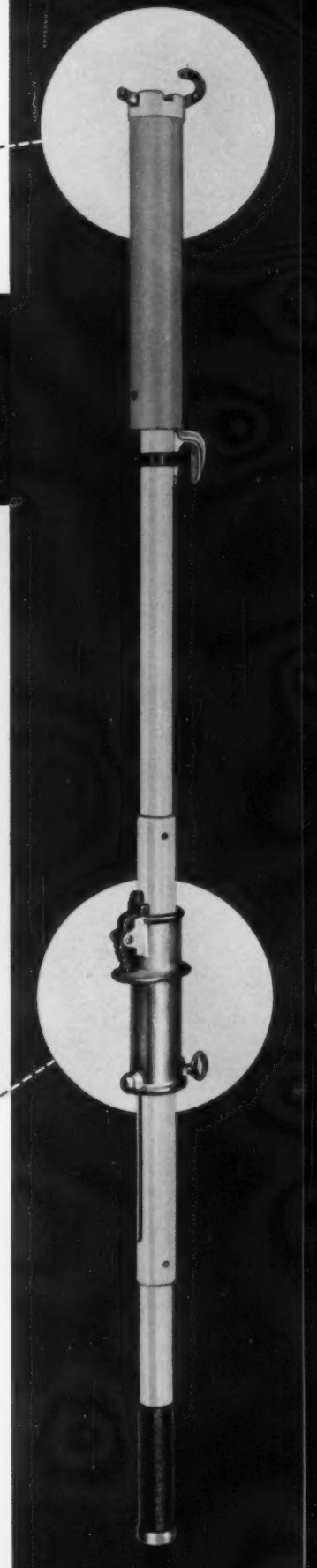
Operating rod mechanism is fully enclosed, protected . . . prevents rod damage, eliminates rod servicing. Only 3 moving parts . . . nothing to bind, stick, get out of adjustment. Field-strips for fast, easy cleaning by removing only *one* screw. Equipped with ¾ hook . . . thumb latch, safety-lock and stop. Non-slip grip.

Yellow non-porous surface instantly shows soil, grease or dirt which might cause excessive leakage . . . wipes "safety-clean" in seconds.

Tested for 100 kv per foot for 5 minutes.
Available in 4′, 6′, 8′, 10′ and 12′ lengths, one-piece or hinged.

801

THUMB LATCH . . . conveniently located on aluminum operating handle. Faster, easier to use with gloves. In latched position keeps hooks open while engaging clamp eye . . . prevents accidental retraction of hook. Sharp downward pull of handle releases latch, closes hook. Safety stop prevents accidental opening of hook while clamp is engaged. A locking wing screw is also provided.



for better construction . . . safer maintenance . . . specify KEARNEY products

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

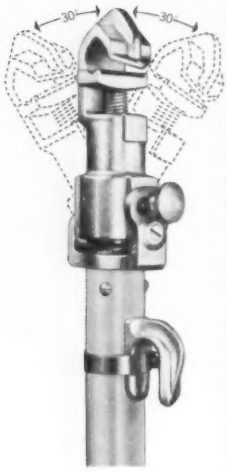
JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue, St. Louis 10, Missouri

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA

3 Kearney products to make the lineman's job easier...safer!

ADJUSTABLE HEAD JUMPER HOLDING TOOL



Aluminum alloy head is adjustable 30-degrees either side of center . . . rigid in all positions.

Gives positive control . . . tight grip . . . easiest handling of slack conductors. Enables linemen to maintain required safety clearance when working jumpers on difficult angles. Invaluable for accurately positioning jumpers at maximum reach from pole . . . for making hot line splices and taps.

Clamping screw has smooth, no-drag drive. Yellow Fiberglas handle and plastic covered, laminated fir, clamp-screw operating rod provide maximum safety. Light weight, wide range . . . 6 solid to 336.4 MCM ACSR. Pole length 4′ or 6′.

JUMPER CLAMP

Extra-wide range accommodates the large conductors of high capacity distribution systems . . . 1,192.5 MCM ACSR or 1,300 MCM stranded to 6 solid. Jumper cables up to 4/0 15,000 volts fit in the T-bolt terminal . . . without disassembly for installation. The aluminum alloy head will carry 400 amps. Maximum safety is assured by a yellow Fiberglas handle over the plastic covered, laminated fir, clamp-screw operating rod with colored-coded, non-slip gripping area. Light weight . . . only 4 pounds.

COMPRESSION FERRULE ALUMINUM GROUNDING SETS

The only "dead" or de-energized circuit is a *grounded circuit.* Get safe cable connections . . . less weight . . . with this family of grounding clamps for *aluminum* grounding cable. Ferrules are compressed onto the cable with the WH-1 or WH-2 hydraulic tool . . . threaded into the frame . . . locked with a jam nut. Take 600 volt aluminum grounding cable up to 4/0. Single grounding clamps and 2-, 3-, or 4-clamp cluster sets available in two sizes with ranges from 8 solid to 666.6 MCM ACSR or to 2″-diameter. Jaws of flat face clamp open 1.5″.

for better construction . . . safer maintenance . . . specify KEARNEY products

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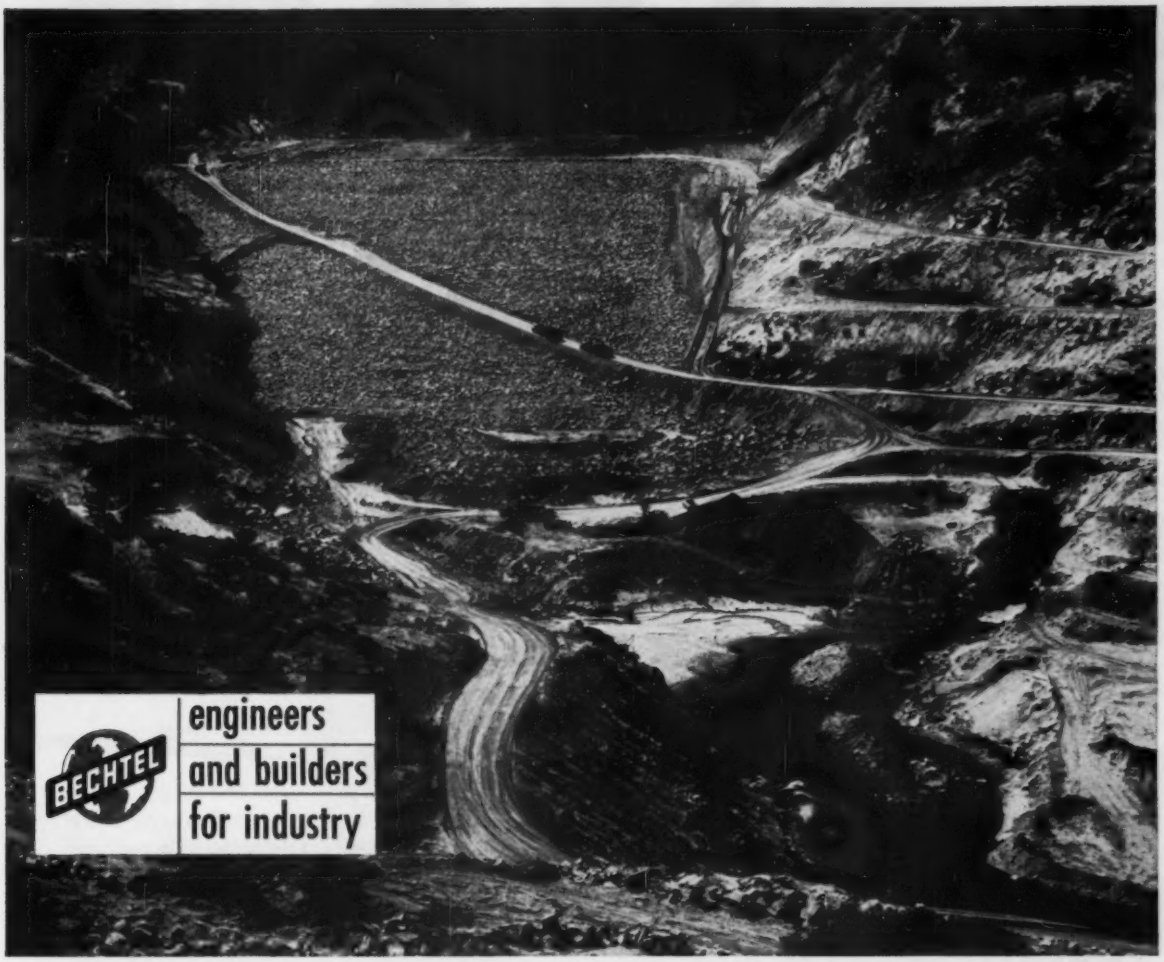
801



Bechtel Experience Helps Create a

NEW JOB FOR A BUSY RIVER

In a major expansion of Southern California Edison Company's Big Creek System, Bechtel has just completed the Mammoth Pool Dam on the San Joaquin River.

The dam is one of the world's highest rolled earthfill dams—469 feet high from foundation to crest, and 825 feet long. It creates a storage reservoir with 123,000 acre feet capacity as a key feature in the Mammoth Pool power development. An 8-mile tunnel carries water from the dam to a new power house which will have a peak capacity of 150,000 kilowatts. The new power house will go into operation this Spring.

Bechtel's depth of experience in the power field, combined with the ability to collaborate closely with Edison's engineers, has worked advantageously for this long-time client—achieving important construction and operating economies on many of its major new projects.

We invite inquiries on any aspect of hydro-electric, steam or nuclear power generation.

BECHTEL CORPORATION

SAN FRANCISCO • Los Angeles • New York • Houston

CANADIAN BECHTEL LIMITED

Montreal • TORONTO • Calgary

BIGGER...

More power packed into new Pennsylvania contour design transformers

More kva per pound

Again, Pennsylvania has raised the kva limit for one-piece, upright shipment of large power transformers. Shell-form, Contour Design transformers are now lighter, more compact . . . and structurally stronger . . . as a result of Pennsylvania's new three-section tank design. Even quieter operation than heretofore also is assured.

The core and coils are assembled in the base section of Pennsylvania's new three-section tank *without the use of a separate frame.* When added and welded into place, the center tank section then provides sturdy side bracing for the internal assembly.

Controlled Clamping Reduces Noise

Before the top section is added, the core is clamped to the bottom section by a method that utilizes controlled pressure—an important factor in noise reduction. Closely spaced jack screws, built into the bracing band around the top of the center tank section, distribute the pressure evenly along the core. Careful control of this pressure reduces the sound level of the entire structure.

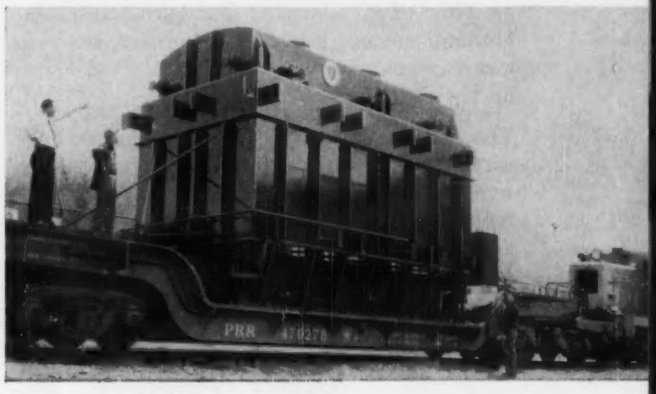
Providing more kva per pound and per cubic foot has been a habit at Pennsylvania since 1952, when the company pioneered one-piece, upright shipment of large power transformers. When larger or higher voltage transformers are required, contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

McGRAW EDISON

315,000 KVA

A new three-section tank and a controlled-pressure method of core clamping* permit more kva per pound and per cubic foot in Pennsylvania shell-form Contour Design transformers. A good example: this 315,000-kva, 230,000-volt unit.

*Patent pending



PENNSYLVANIA contour design

···YET SMALLER AND QUIETER

1. Multi-section FOA coolers are easily field mounted, utilizing only four brackets each. A minimum of field work is required for piping and electrical connections.

2. Welded joint between top and center tank sections. Core is clamped with jack screws at top of center tank section.

3. Welded joint between center and base tank sections. Core rests on base section of tank.

POWER TRANSFORMERS

PENNSYLVANIA TRANSFORMER

KPF switches

Trouble-free Simplicity

of design, of operation

INSTALL KPF switches more quickly on hot or dead lines, at less cost. Just bore holes in crossarms, mount phase units, connect conductors. No precision requirements, no heavy extra mounting structures, no temperamental complex mechanism to bind, freeze, malfunction or need lubrication.

Rugged, lightweight KPF switches have proved their dependability and economy in half a century of major utility service. Make a test installation on your system—this month.

Fully closed.
Bell crank on crossarm, operated by control rod, will rotate switch blade arm clockwise away from stationary arm holding switch contact clip.

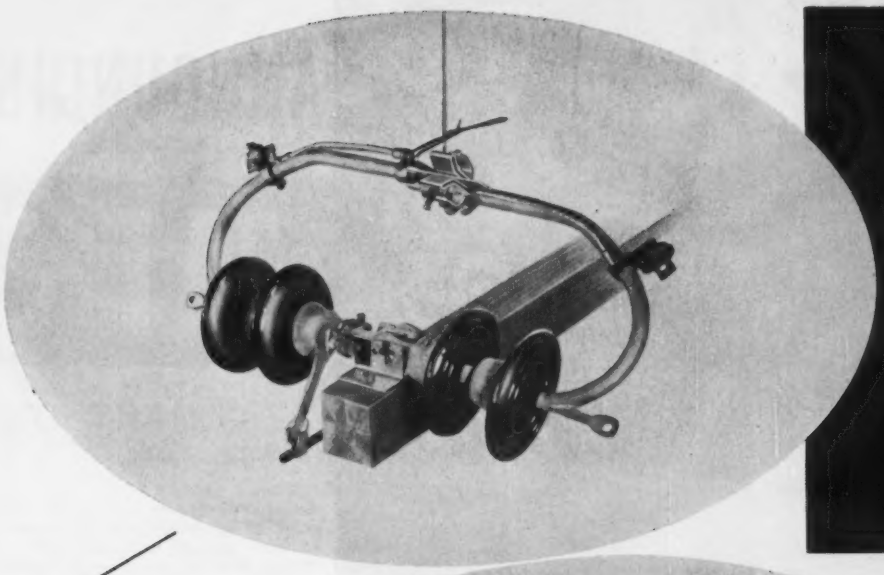
Switch blade arm partially rotated.
Switch blade has separated from clip. Quick-break whisker carries current, prevents arcing.

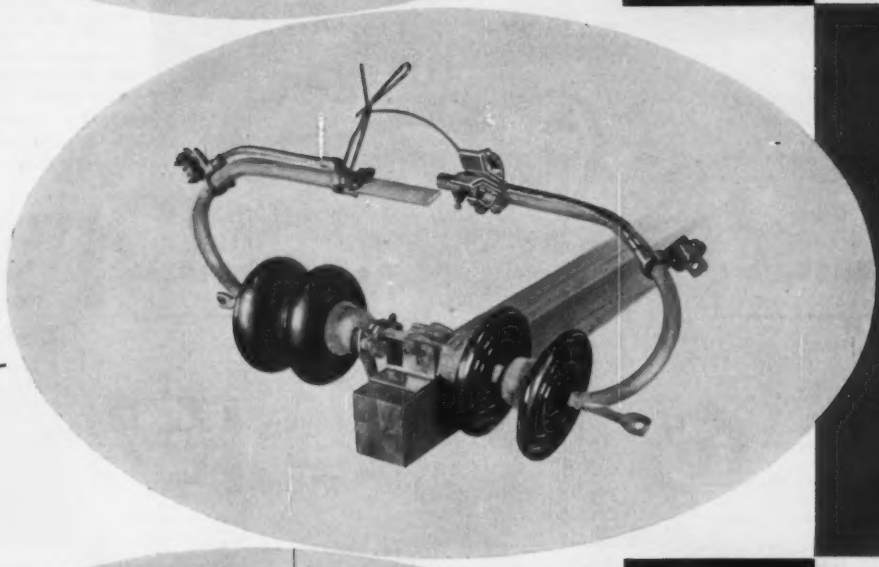
Switch fully open.
Quick-break has snapped free instantly, preventing arcing. KPF switches operate smoothly despite icing, crossarm warpage; never need lubrication.

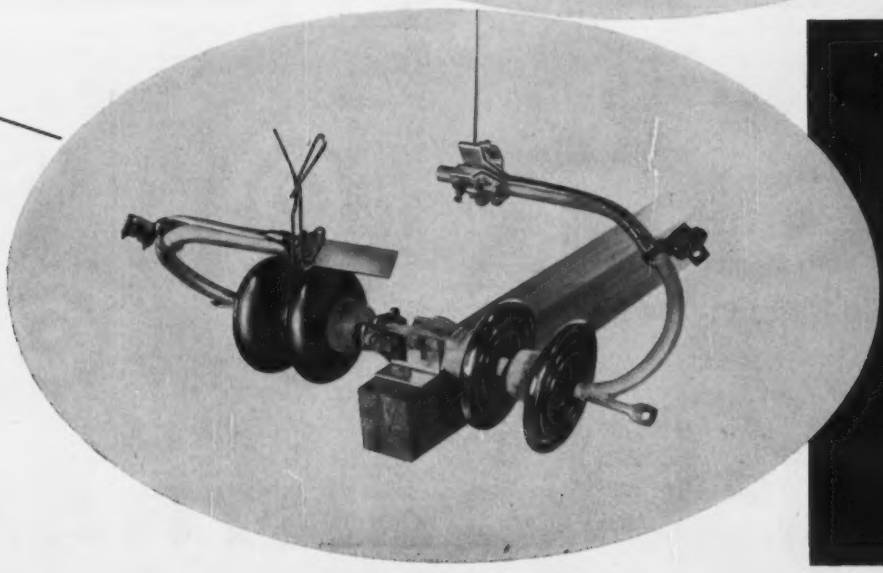
KPF
AIR BREAK SWITCHES
Standard for half a century

KPF ELECTRIC COMPANY
P.O. Box 1257E • Stockton, California
HOward 4-8381

5214



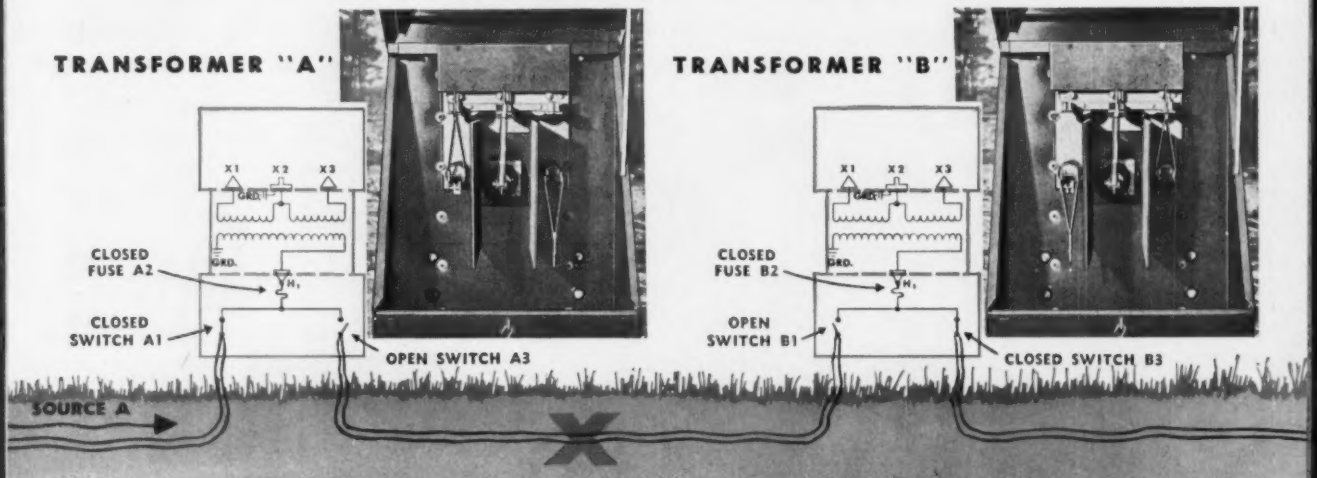




ANNOUNCING.

MINI

Shown at left is the first of 21 Central MINI-SUB transformer units now being installed to provide electric service to one of Little Rock, Arkansas' newest residential sub-divisions. Installation is under the direction of Lyle Hayden (left), Division Engineer, and John Lee (right), Division Superintendent for Arkansas Power & Light Co.



The schematic drawings above represent part of an underground system employing Central MINI-SUB units and show various switching combinations for de-energizing cable sections and/or transformers. For example, should maintenance work be required at Point X on the underground cable, the entire cable section between MINI-SUB A and MINI-SUB B could be de-energized by opening Switches A3 and B1. Power Source A would continue to serve Transformer A and Power Source B would continue to provide service for all other MINI-SUBS in the system. To de-energize a single transformer, without interrupting power flow, each MINI-SUB is provided with a disconnect fuse which can be easily and safely opened (see Fuse C). Each primary compartment of the MINI-SUB features two blade type disconnects for isolating the high voltage source on both sides of the unit. These S&C Electric Co. Disconnects are designed to interrupt full load current up to 200 amperes with no external arc when opened with a Loadbuster tool. These Disconnects function externally to the transformer, thus eliminating arc contamination of the transformer oil. They also provide a visible air gap when open.

CENTRAL

.CENTRAL'S *Revolutionary* NEW

-SUB Transformer

MORE THAN A TRANSFORMER! In Fact, a Miniature Substation Designed For Use in Residential Underground Systems

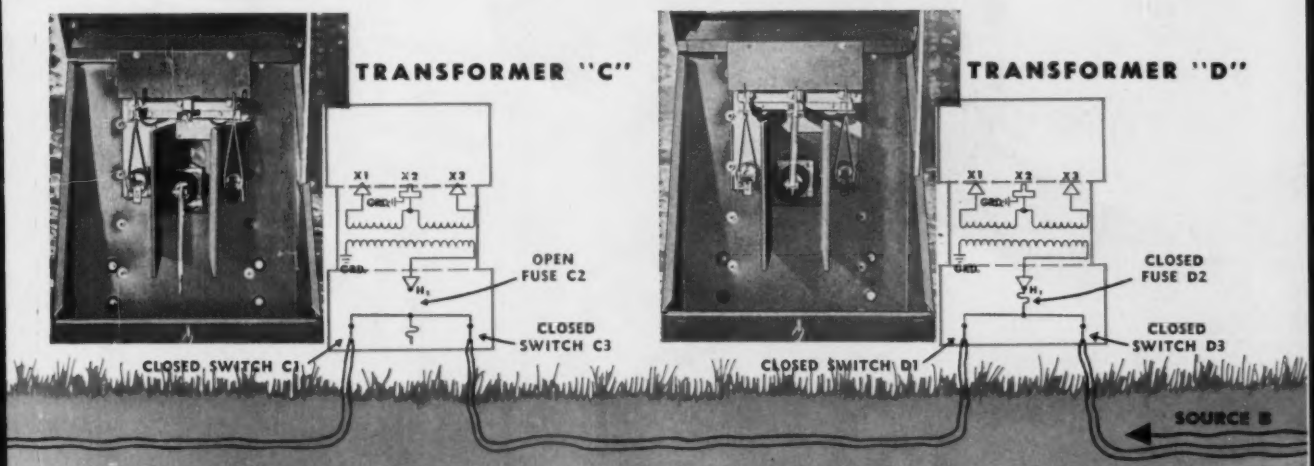
Central's MINI-SUB transformer unit is designed especially for safe, efficient, economical operation in modern underground distribution systems.

The high and low voltage terminals are housed in separate compartments bolted to the sealed type transformer. The high voltage compartment may be installed separately to permit early completion of the high voltage loop and establishment of sectionalizing switch points.

The transformer and secondary compartment may be installed subsequently, depending upon load requirements.

As load requirements increase, larger KVA transformers may be installed with minimum time and effort and without disturbing primary cable connections.

Central's miniature substation provides safe, convenient, and visible switching facilities and fuse protection. It is designed to fulfill long range requirements of modern underground Distribution service. It is presently available in sizes 25 through 167 KVA, without taps, in voltages 13,860GrdY, 13,200GrdY, and 12,470GrdY to 240/120 volts.



A newly designed S&C distribution class boric acid disconnecting fuse rated 50 amperes continuous, 5000 ampere maximum interrupting and suitable for operation in a metal enclosure, provides fault protection. Its exhaust gases are non-conductive and are confined within the enclosure. An important feature of the new fuse is that its rating and time current curves are such that it can see and remove not only internal faults but a majority of faults in the secondary system. Because of its location in the circuit, it can also detect faults in the primary bushing. The disconnecting fuse may be opened under load conditions when used with the Loadbuster tool disconnecting the transformer from the source. The epoxy glass fuse may be replaced without untanking the transformer.

The low voltage compartment of the MINI-SUB provides easy access to secondary terminals to facilitate installation of low voltage cables and to guarantee ease of service and safety of operation. Adequate space is provided for secondary fuses if desired and for making up cable connections serving 8 to 12 houses.

CTC

Sales Offices in Principal Cities

Transformer Corporation

Telephone JEfferson 4-5332

PINE BLUFF, ARKANSAS

Plants at Pine Bluff, Arkansas and Arcadia, Florida

NEMA

Industry-proved through a quarter century of service... **THERE'S NO DOUBT ABOUT NEOPRENE**

Neoprene jacketing on the job... at −65° F.

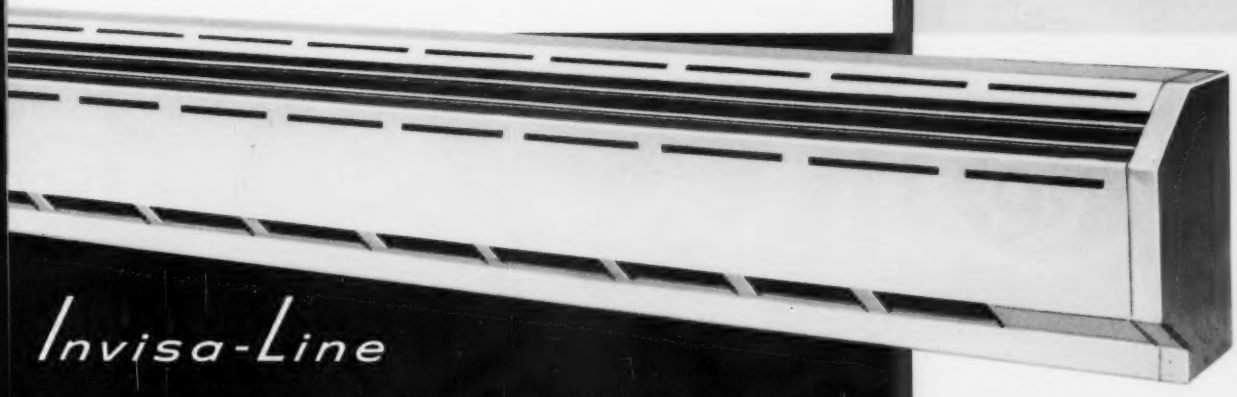
Specially compounded neoprene jackets can withstand mandrel wrap tests down to −65° F.—often required in military specifications. Even at 65 below, neoprene jackets remain flexible for portable uses. More important is neoprene's excellent retention of low-temperature properties after years of aging. This holds true for all of neoprene's combination of properties... properties that insure long-term reliability. For information, write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. EW-2, Wilmington 98, Delaware.

DU PONT NEOPRENE

Better Things for Better Living... *through Chemistry*

brings a world of ● *warmth...*

Arvin TAKES THE LEAD IN ELECTRIC HEATING



Invisa-Line

A scant 1¼ inches thin, a sleek 4½ inches low—Arvin Invisa-Line low wattage baseboard brings you an exciting new dimension in electric heating. Here is a unit that hugs the wall and disappears from conscious view once installed. And it's yours exclusively from Arvin, world leader in portable electric heat and pioneer in electric and car heating for more than a quarter century.

Arvin not only features the pace-setting advantage of the most attractive size . . . Arvin gives you the added advantage of greater safety! with Arvin's *true low wattage*—only 140 watts per lineal foot! Now you can sell these customer-convincing benefits: complete safety, more even heat distribution, no "*hot spots*" in the room. Arvin's extensive experience in providing electric heat comfort is reflected in the outstanding design and quality construction of the "heating heart" of this far-advanced unit. *A world of warmth* tells the comfort story of Arvin baseboard heat units that make the most of *all* of electric heating's advantages that insure customer satisfaction.

Electric heating is here and rapidly growing in acceptance. Team up with Arvin, foremost in styling, safety and merchandising know-how to assure yourself the biggest possible share of business from the expanding electric heating market. Compare Arvin electric baseboard with any other unit. *See* the difference in size. *Check* the safety difference in wattage. And note the tremendous selling advantages Arvin offers you with its established and accepted brand name that's nationally advertised . . . plus a hard-hitting merchandising program specifically designed to help make your Arvin electric heat sales the easiest of all in this rapidly expanding market.

the slimmest
(Only 1 3/4" Thin)

the trimmest
(Only 4 1/2" Low)

the most advanced
(Only 140 Watts per foot)

TRULY LOW WATTAGE
BASEBOARD
ELECTRIC HEAT

MILLIONS OF FAMILIES ENJOY ARVIN PRODUCTS

Arvin

All You Notice is the Warmth with ARVIN'S INVISA-LINE UNIT!

Attractively finished in the finest beige enamel, Arvin Invisa-Line baseboard heat units blend beautifully into any room of any style home. The low, slim design hugs the wall in such an inconspicuous manner, Arvin baseboard disappears from view once it is installed. The sections can be painted to match walls or baseboard if desired. Note the handsome chrome top grill that prevents objects from falling into unit and aids in directing the warm air flow outward and upward into the room.

Arvin Invisa-Line's advantages

increase the sales power of your electric heating story

Brand Acceptance—Millions of families enjoy Arvin products, advertised nationally in leading magazines. The Arvin brand name is presold and is recognized as the *leading name* in portable electric heat. These factors combined help assure ready-made acceptance for Arvin *baseboard* heat!

Research—Serving the Arvin family of finer products, manufactured in 15 Arvin plants, are the extensive Arvin research and development facilities . . . where Arvin electric baseboard heat was designed using 27 years of experience. The result—the most advanced heating systems available to builders.

Product Excellence—The exclusive design and construction of Arvin baseboard heat adds extra selling power to every advantage of electric heating:

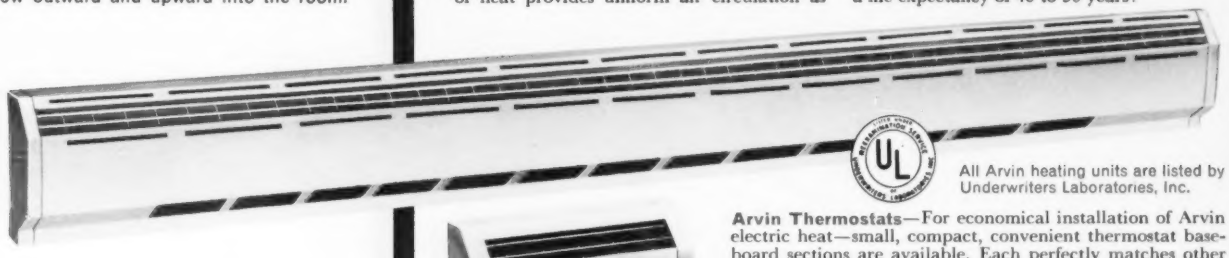
Greatest Eye-Pleasing Design and Safety—Arvin baseboard heat's unmatched trimness blends easiest into any decor, and its low wattage assures safest performance.

The Quietest, Cleanest, Fastest Heat—Arvin's heating element is mounted on floating holders to eliminate all expansion and contraction noises. The natural convection of heat provides uniform air circulation as the high-capacity heating element produces heat faster and more efficiently.

Most Accurate Heat Control—Individual thermostats provide individual room-comfort control . . . plus the unparalleled economy that results from this flexible heat control. And for absolute safety in controlling heat output, exclusive Arvin "heat-limit" safety thermostats, built into each baseboard section, prevent overheating.

Lowest Installation Cost—Arvin baseboard heat eliminates the need for expensive central heating plant installation, saves approximately 15 square feet of floor space at $10 to $15 per foot, plus a chimney at $80-$100, and all ductwork. What's more, Arvin baseboard heat sections are *pre-wired* for connection at either end saving you the time and labor costs of wiring-in.

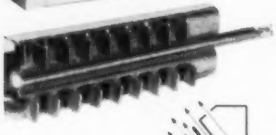
Greater Home Value—A home electrically heated with Arvin baseboard units is a better built home. It's better insulated, better equipped with the most advanced and efficient of all electric baseboard systems, and it represents greater loan potential. Remember, too, a warm air furnace requires replacement or major repair every 10 years, whereas electric heat units, with no moving parts, have a life expectancy of 40 to 50 years!

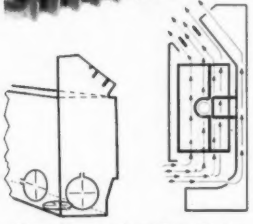


All Arvin heating units are listed by Underwriters Laboratories, Inc.

ARVIN PRE-SELLS FOR YOU!

Across America, in leading magazines and local newspapers, powerful and colorful advertising is bringing the Arvin story of performance and quality to millions. Arvin Electric Heat is promoted as a member of the Arvin family of finer products in customer-convincing ads that mean more and easier sales for you!





Three Knockouts at Both Ends Simplify Wiring

Arvin Thermostats—For economical installation of Arvin electric heat—small, compact, convenient thermostat baseboard sections are available. Each perfectly matches other sections to provide a neat, inconspicuous installation. Arvin baseboard thermostat sections save the cost of "wiring in" a wall thermostat. Arvin wall thermostats can be used if desired. In addition to baseboard thermostat sections, one or more Arvin "*heat-limit*" safety thermostats are pre-wired into each regular section, depending on length. This safety feature, pioneered by Arvin, makes the safest heat even safer!

Arvin Heavy-Duty Fins—Faster, more efficient heat transfer—from heating element, to fins to room—is assured by advanced Arvin engineering. The extra heavy continuous fins are an integral part of the thick metal section that is welded to the entire length of heating element. To assure long, trouble-free life, heating element temperature is held to one-third of rated capacity. Heavy-duty heating element is fully guaranteed for five years, can be expected to last indefinitely!

Arvin Designs For Best Air Flow—The efficient air flow through Arvin baseboard units is indicated by arrows. Cool air enters bottom of unit, passes over radiating fins where it is warmed and is then radiated outward and convected upward. Secondary air passage in rear of unit keeps back cooler and side air circulation. New chrome baffle attaches to front of fin section, reflecting heat into air passage to further increase warm air circulation efficiency.

High Wattage Baseboard—2″ wide, 6″ high. Approximately 300 watts per linear foot. 2150 to 7270 BTU output and 2867 to 9693 BTU output.

No Other Baseboard Heat Offers the Over-All Trimness of ARVIN INVISA-LINE, plus True Low Wattage for Maximum Safety!

Arvin Electric Radiant Cable Heat

The finest in concealed heat. New! No braid or loom required; cold leads have heavy, UF-type insulation. Easily installed with new-design staples. Nickel-chrome elements.

Arvin Wall Thermostats

Single and double pole models. Fast reaction, dependable operation. Element reacts to *both* room air temperature and radiant heat. Flush-mounting; wires from front.

Arvin Built-In Wall Heaters

A *complete* line—six fan-forced radiant models, from 3413 to 13,652 BTU capacities. Instant-heating elements. Each model features new-design rough-in box, quick-fastening clamps, reducing installation time and costs.

Arvin

Electric Heat Division

ARVIN INDUSTRIES, INC.

Columbus, Indiana

Here are America's first six CE-Sulzer once-through boilers: All have L&N Direct-Energy Balance Control.

Company	*Station*	*Operating Pressure (psig)*	*Capability*
Dayton Power & Light Co.	Tait 4	2400	150 MW
Metropolitan Edison Co.	Portland 1	2400	165 MW
Dayton Power & Light Co.	Tait 5	2400	150 MW
Philadelphia Electric Co.	Eddystone 1	5000	325 MW
Cleveland Electric Illuminating Co.	Avon 8	3500	250 MW
Philadelphia Electric Co.	Eddystone 2	3500	325 MW

New L&N Direct-Energy Balance Control Coordinates Once-Through Boiler and Turbine

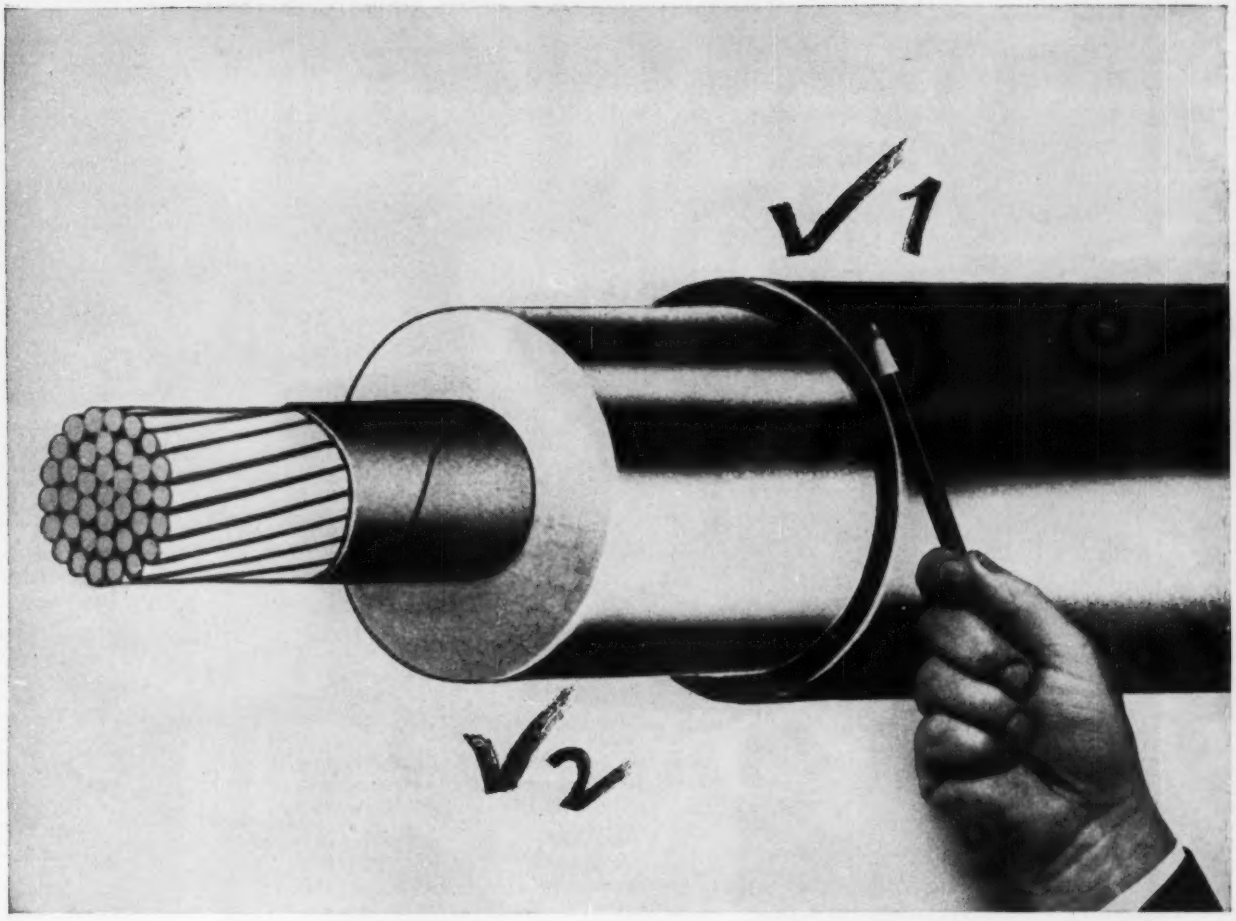
Philadelphia Electric Company's Eddystone Unit No. 1, the world's highest pressure and temperature (5000 psi and 1200°F) steam generator, employs the largest CE-Sulzer, once-through boiler ever built.

A new type of combustion control, Direct-Energy Balance, coordinates boiler-turbine operation by considering them as an integral unit. From combined steam pressure and generator intelligence, D.E.B. controls regulation of both fuel input and turbine governor valves. Excess air is "trimmed" automatically by flue gas oxygen analyzing equipment.

In the picture above, an operator at Eddystone is using the D.E.B. Control to set directly the desired rate of generation change. When he calls for a change in load, the control responds quickly, at the pre-set rate of change. Operation of the unit is integrated because (1) boiler-turbine output is changed in a predetermined, orderly manner, and (2) output is kept within the capabilities of the equipment in service.

In designing the Direct-Energy Balance method, L&N engineers sought a basic improvement over conventional combustion controls. Based on 30 years' experience in power plant measurements and controls, this new method was developed, subjected to simulation studies, and extensively field-tested. Direct-Energy Balance Control has also been selected for Unit 2 at Eddystone, a supercritical unit of 3500 psi. For information on this new concept in combustion control, call your nearby Field Office, or write for Reprint 463(8) to 4938 Stenton Avenue, Philadelphia 44, Pa.

Direct-Energy Balance Control... engineered to power plant standards by LEEDS Instruments & NORTHRUP Automatic Controls • Furnaces



Check these superior
GENERAL ELECTRIC SUPER

✓ 1. Flamenol* jacket:

—excellent dielectric properties.
—resistance to oils, acids, alkalis, flame, sunlight, and moisture.
—resistance to abrasion and corona cutting.
—moisture absorption equal to or better than good moisture-resistant rubber insulations.
—permanent color coding for easy circuit identification.
—easy pulling in ducts and conduits.

✓ 2. Super Coronol* insulation:

—uniformity of insulation on high-voltage cables is controlled by unique method of vulcanizing vertically downward.
—centering of conductor in the insulation checked by means of X-ray readings.
—ozone and heat resistance.
—sunlight and moisture resistance.
—excellent current-carrying capacity 90 C up to 5000 volts, 85 C from 5001 volts up to 15,000 volts.
—ability to withstand severe overloading.

Progress Is Our Most Important Product

GENERAL ELECTRIC

features built into
CORONOL FLAMENOL CABLE

These features make General Electric Super Coronol Flamenol cables ideal for economical, dependable use in conduit, open air, racks or trays, and for direct burial in both wet and dry locations. Comparable special benefits are built into all General Electric wire and cable—the result of the wide scope of General Electric's laboratory research and General Electric's long years of design and manufacturing experience in the wire and cable field.

**Registered trade-mark General Electric Company.*

For further information on G-E Super Coronol Flamenol cable, mail the handy coupon.

General Electric Company
Wire and Cable Department
Section W227-22-7
Bridgeport 2, Conn.

Please send me your booklet on G-E Super Coronol Flamenol Cables.

Name _____

Title _____

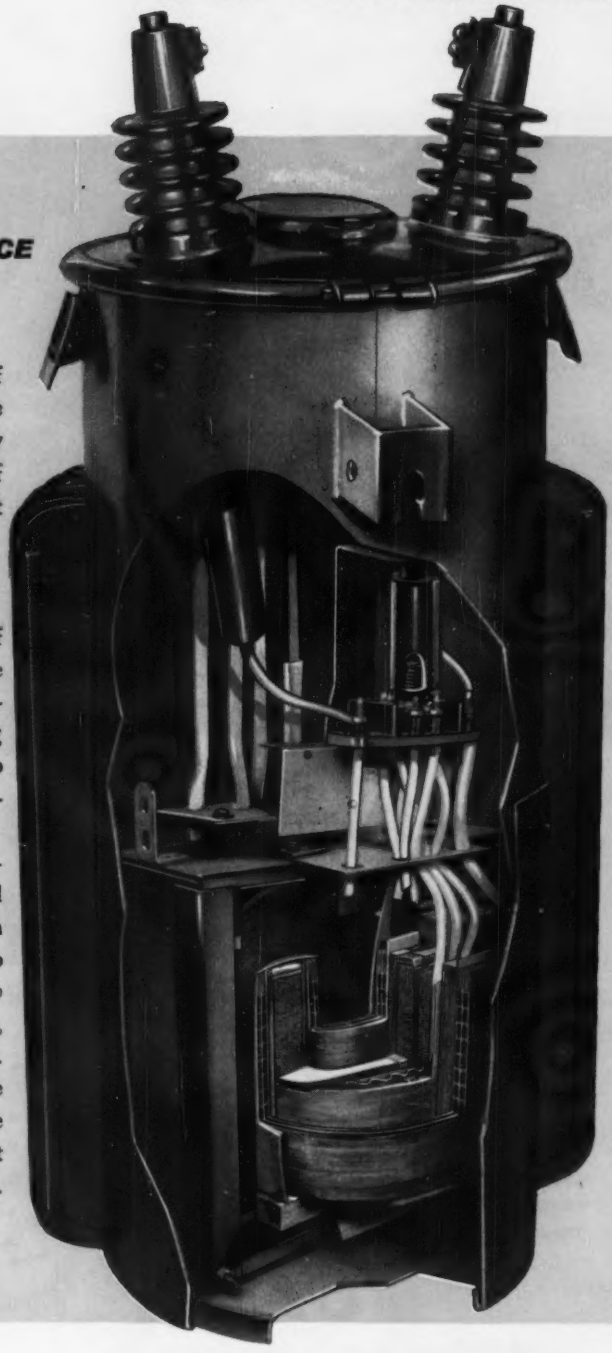
Company _____

Address _____

City _____ Zone _____ State _____

Get the most for your

with WAGNER



MORE FOR YOUR MONEY IN ELECTRICAL PERFORMANCE

CORES WITH LOWER LOSSES

Wagner Form W cores are made of highest quality annealed steel, and are skillfully constructed to provide a low reluctance path for the magnetic lines of force to keep losses and exciting current low.

COILS WITH LOWER IMPEDANCES

Wagner Form W coils are wound of carefully selected and tested copper wire or strip. Layer, channel and barrier insulation is coated with a thermo-setting material that bonds the coil structure into a mechanically strong, electrically efficient, quiet-operating unit.

Recent Wagner engineering developments in the method of insulating and winding coils of pole type distribution transformers have made it possible to provide impedances from 10% to 15% *below* present impedances. At the same time, short circuit strength is greatly increased. Short circuit tests, with full line voltage applied, prove that these transformers are capable of withstanding short circuit stresses far in excess of industry standards.

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL...AUTOMOTIVE*

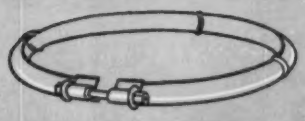
distribution transformer dollar

FORM W TRANSFORMERS

At Wagner, research and development teams are constantly working on distribution transformer improvements. They are testing new methods and materials . . . developing new design concepts . . . in a constant search for improvements that will give you the most from your distribution transformer investment. The result: better electrical performance . . . longer lasting parts . . . improved mechanical features—to give you all the characteristics you want in transformers for your distribution system.

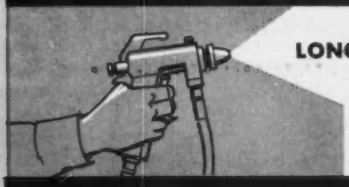
A complete line of Form W pole-type transformers, from 3 to 167 kva, 15 KV and below, is available from factory, branch, and distributor stocks. Consult your Wagner Sales Engineer about your transformer requirements, or write us.

MORE FOR YOUR MONEY IN MECHANICAL FEATURES:

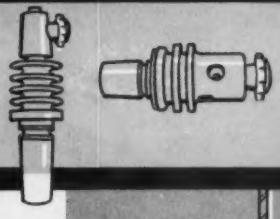


SHUR-SEAL CLAMPING RING

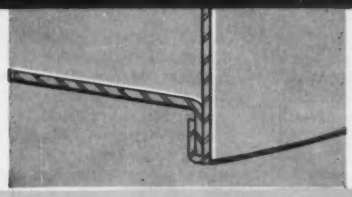
Holds cover to the tank with an airtight seal . . . no atmospheric moisture or dust particles can get inside to contaminate the oil and shorten transformer life. No oil can leak out during shipping or handling. Cover may be removed by loosening a single bolt.



LONG LASTING TANK FINISH. A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.

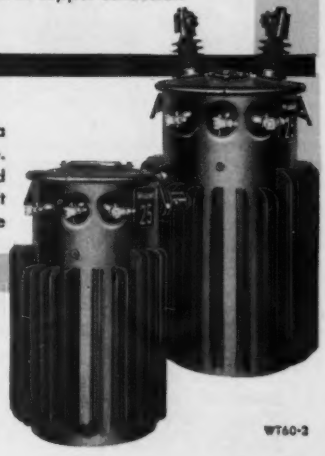


SAFETY KEYED BUSHINGS. Heavy wet-process porcelain high-voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.



ROLLED-UNDER BASES

This new base design provides extra strength . . . better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessons the chance for finish damage due to scraping.



WT60-2

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

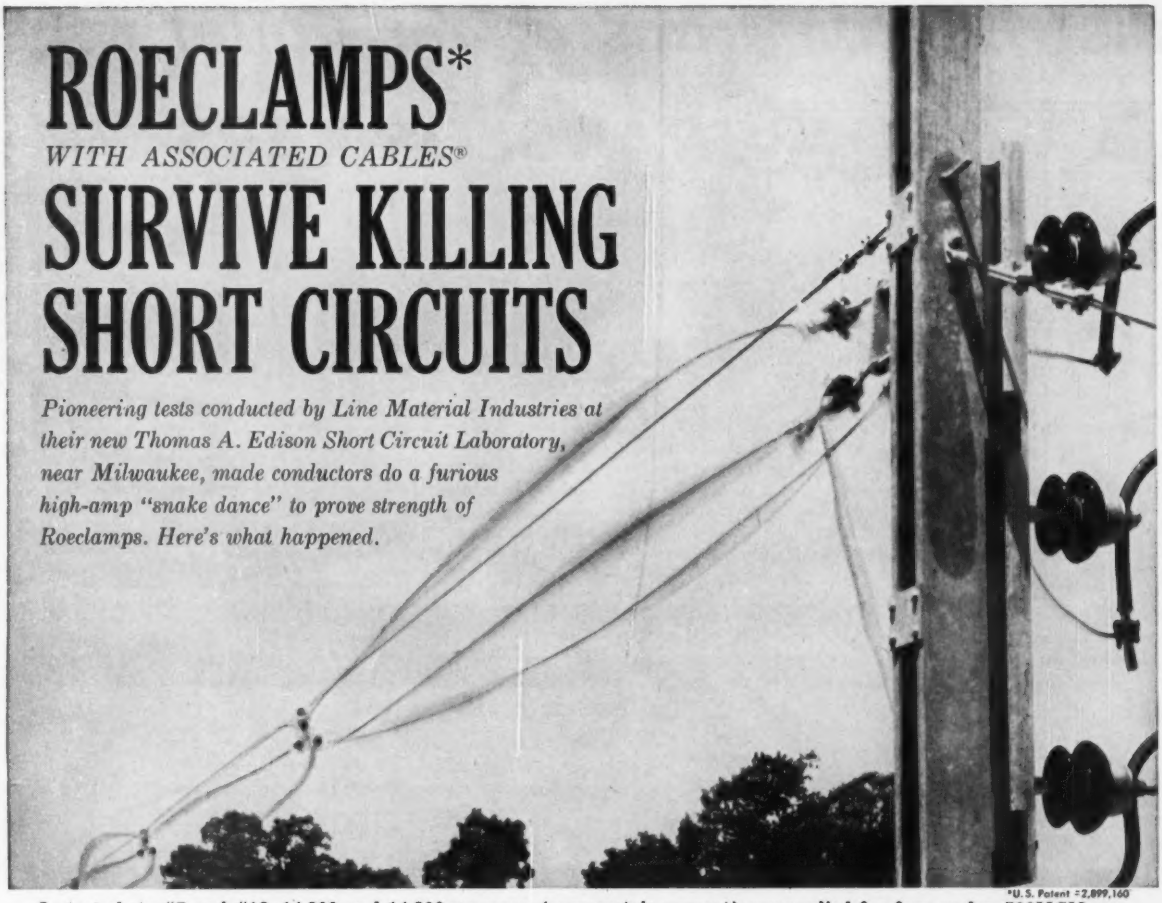
6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

ROECLAMPS*

WITH ASSOCIATED CABLES®

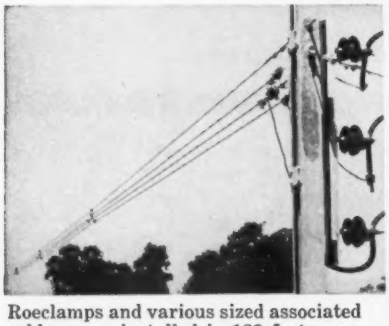
SURVIVE KILLING SHORT CIRCUITS

Pioneering tests conducted by Line Material Industries at their new Thomas A. Edison Short Circuit Laboratory, near Milwaukee, made conductors do a furious high-amp "snake dance" to prove strength of Roeclamps. Here's what happened.

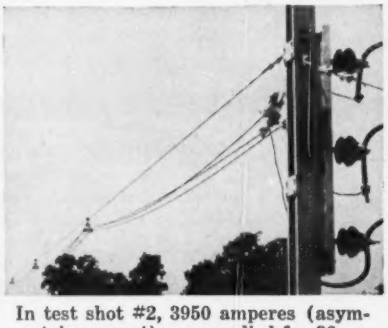


*U. S. Patent #2,899,160

In test shots #7 and #12, 14,300 and 14,200 amperes (asymmetric current) are applied for four cycles. 500MCM conductors are whipped around with incredible force. Strong 5KV and 15KV Roeclamps contain the cables, and withstand this fantastic overload. These were two of over a dozen test shots conducted in the impartial Line Material laboratory.



Roeclamps and various sized associated cables were installed in 128 feet span, shorted at far end and linked with power source and controls inside Line Material Industries' new laboratory. Every 30 feet a Roeclamp holds cables and messenger firmly in place. Roeclamps require no installation tools, can be mounted in less than a minute, even with "boxing gloves" on.



In test shot #2, 3950 amperes (asymmetric current) was applied for 30 cycles to a #6 AWG conductor. This was approximately 100% beyond the rated thermal capacity of the insulation. Note that the 5KV Roeclamps are undamaged. In this test the intense heat (conductor temperature 395°C) elongated the cables but they soon resumed their former profile.

Line Material Industries' short circuit Lab features a closed circuit TV Monitor panel to observe testing. It has the most modern metering equipment, and the world's highest speed, 60-cycle generator for short circuit testing. This can deliver over 500,000 KVA of electrical energy momentarily. A 1,500,000 KVA air blast breaker can interrupt 80,000 amperes after any pre-set current flow.

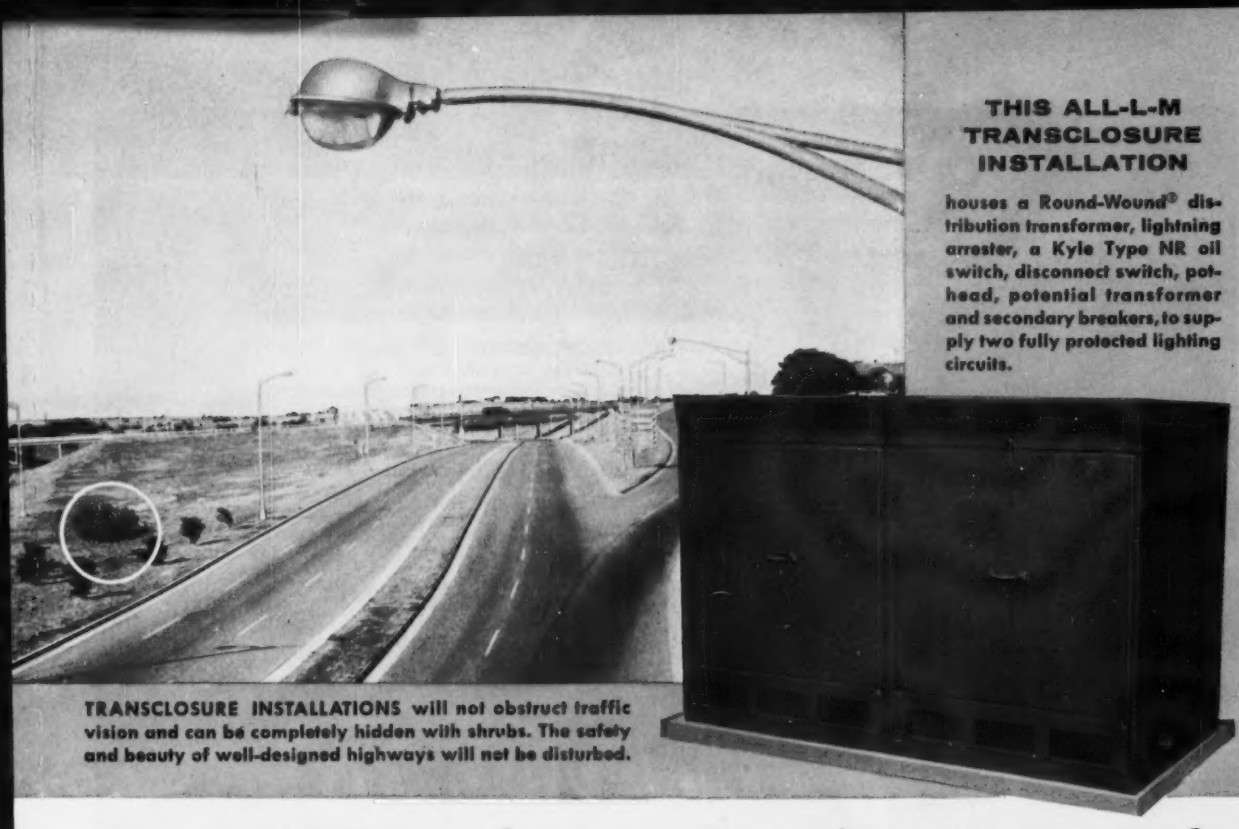
NOW ON FILM

SEE THESE STARTLING TESTS OF ROECLAMPS WITH ASSOCIATED CABLES FOR YOURSELF

A 16mm color movie, showing the complete series of tests is now ready for showing to technical groups. For details write to Line Material Industries, McGraw-Edison Company, 700 W. Michigan Street, Milwaukee 3, Wis., or to Roebling's Electrical Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
John A. Roebling's Sons Division
The Colorado Fuel and Iron Corporation



THIS ALL-L-M TRANSCLOSURE INSTALLATION

houses a Round-Wound® distribution transformer, lightning arrester, a Kyle Type NR oil switch, disconnect switch, pothead, potential transformer and secondary breakers, to supply two fully protected lighting circuits.

TRANSCLOSURE INSTALLATIONS will not obstruct traffic vision and can be completely hidden with shrubs. The safety and beauty of well-designed highways will not be disturbed.

New L-M Transclosures Save $1,750 On Each Highway Lighting Transformer Installation

New enclosure with modular construction offers savings in cost, erection time and space; permits transformer installations at the load center.

by C. W. PETERSEN, Product Manager
Line Construction Materials
Line Material Industries

Costs of expressway and highway lighting can be greatly reduced by use of the new L-M Transclosure(TM) for all transformer installations. The Transclosure will house a standard oil-filled transformer, lightning arrester, oil switch, disconnect switch, pothead, secondary breakers and potential transformer. Using the Transclosure instead of the conventional concrete block or brick housing offers an estimated saving of $1,750 per transformer installation. On a projected 60 miles of highway, where 100 to 125 installations are expected, a total saving of from $175,000 to $218,000 is anticipated.

Basically the Transclosure is a weatherproof enclosure, fabricated of heavy-gauge steel, to be mounted on a concrete pad. It houses the transformer and associated equipment. It provides ample ventilation for the transformer by means of vents at top and bottom, with baffles to prohibit entrance of all foreign objects, including wildlife. Removable primary and secondary doors can be padlocked to prevent unauthorized personnel from entering, yet they provide complete and easy access to the equipment.

Interlocking design assures a weatherproof housing; the sloped roof sheds rain. Modular construction permits ganging the units to provide whatever space is required. Units may also be expanded vertically by installation of larger side panels and bottom vents. Transclosures are available in three sizes, to accommodate transformers up to 100 kva. Small in size and light in weight, they are designed to be assembled at the job site. A complete installation, including transformer and associated equipment, has been installed with less than two man-days of labor.

The clean, low lines produce a silhouette that does not detract from highway beauty or obstruct traffic vision. Low shrubs will hide the entire installation completely. Transclosures may be installed precisely at the lighting load center, eliminating all overhead construction and producing the shortest and most economical secondary runs.

Get Complete Information

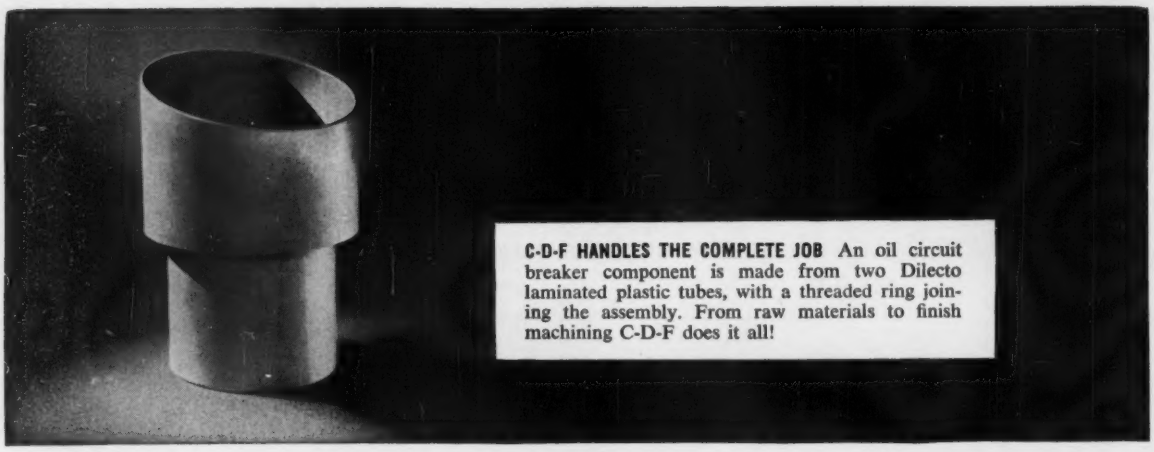
These are just a few of the reasons why many engineers are specifying this new approach to inexpensive highway lighting. For complete details, contact your L-M Field Engineer or Lighting Engineer or write me direct at Line Material Industries, Milwaukee 1, Wisconsin. 407

LINE MATERIAL® Industries *Transclosures*

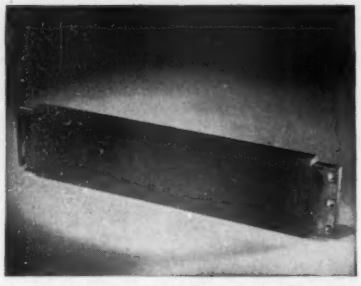
McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW-EDISON

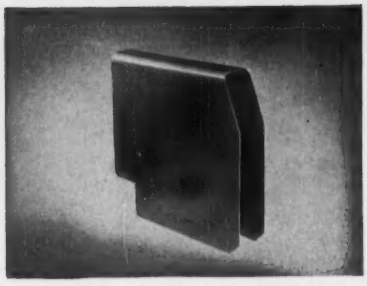


C-D-F HANDLES THE COMPLETE JOB An oil circuit breaker component is made from two Dilecto laminated plastic tubes, with a threaded ring joining the assembly. From raw materials to finish machining C-D-F does it all!



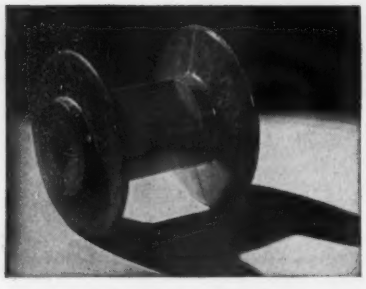
C-D-F KNOWS HOW TO MACHINE PLASTICS. A bus bar gets a covering of molded Dilecto over copper supplied by the customer. The plastic ends are skillfully trimmed on a smooth saw.

C-D-F MOLDS MANY SPECIALTIES. This shaft insulator for a circuit breaker is molded from C-D-F's cloth-based industrial thermosetting plastic, Celoron. Note complexity of mold, clean detailing.



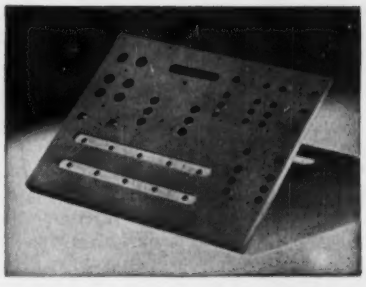
C-D-F USES MODERN METHODS. Large quantities of arc chute barriers are made from paper-based Dilecto. Operations include pressing, cutting, post-forming and trimming.

Dependable equipment relies on C D F insulation!



C-D-F OFFERS UNIQUE MATERIALS. This contact shaft for an air circuit breaker is another example of molded C-D-F Celoron used in switchgear because of its high impact strength.

C-D-F IS A SKILLFUL ASSEMBLER. Made from Grade C rolled Dilecto tubing, these pots are turned, bored, slotted. Then a macerated plastic end is inserted and arc resistant varnish finish applied.



C-D-F UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS. Precisely machined to close tolerances, Dilecto panel boards guarantee dependable insulation, help designers save space.

See our catalog in Sweet's Design File for basic product data and sales offices. Write for detailed information, or send us your print for quotation.

CONTINENTAL-DIAMOND FIBRE

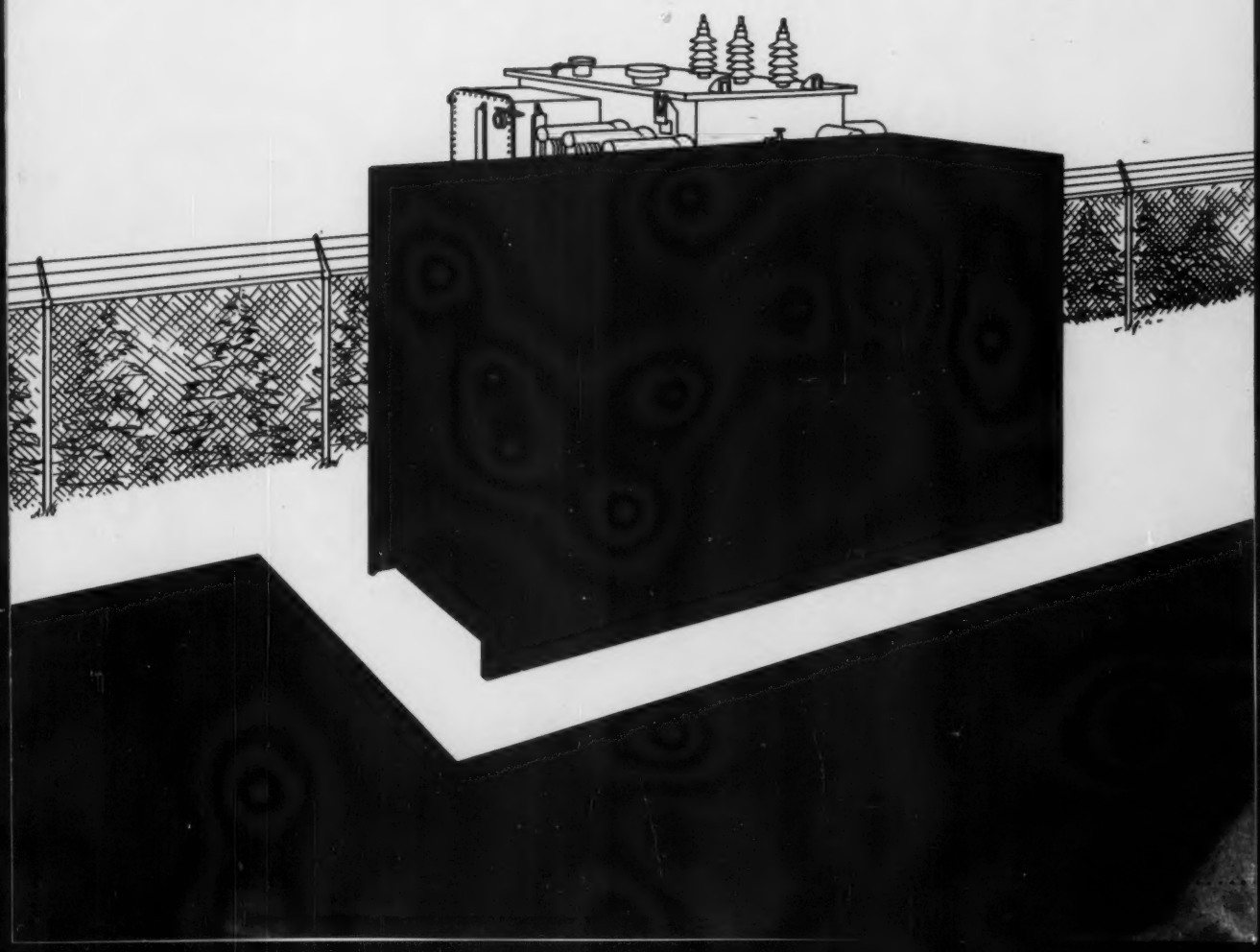
A SUBSIDIARY OF THE Budd COMPANY • NEWARK 15, DELAWARE

In Canada: Continental-Diamond Fibre of Canada, Ltd., 46 Hollinger Road, Toronto 16, Ont.

NEW ALUMINUM SUBSTATION UNITS

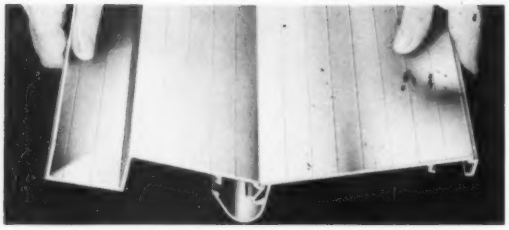
—developed by Allis-Chalmers with Reynolds Aluminum—

OFFER LOWER MAINTENANCE,
CORROSION-RESISTANCE,
ATTRACTIVE APPEARANCE



Lasting Beauty
Your Community Will Be Proud of—
Allis-Chalmers Aluminum-Clad
Substation Units

Use of Aluminum in Substations Adds New Economy, Long-Range Savings in Electrical Installations



Panels for Aluma-Clad switchgear housing snap together so that joints between them are water tight. Extruded aluminum panels interlock to form reinforced sections.

Bolted-on rear panel sections are easily removed by *one man* without use of a crane. Each switchgear cubicle can be inspected individually. Ventilation in this region is increased by using the labyrinth cross-section of the aluminum extrusions to pass filtered air up through the bottom and out the top. This increased cooling of the bus compartment keeps the operating temperature within maximum limits even during peak load periods on hot days.

Developed by Allis-Chalmers and Reynolds engineers, this new aluminum substation unit offers many important advantages in electrical installations. Extruded aluminum sections that interlock to form structurally reinforced panels are used in construction to reduce labor costs, provide strength and rigidity. The station flooring also utilizes aluminum sections that interlock to provide a neat, clean installation.

Aluminum will never rust, therefore these units will never need protective painting. They'll resist corrosion in salt air and contaminated atmospheres.

The bright natural sheen of aluminum is a lasting one, too. That means these aluminum-clad substations will add real beauty to your installation, beauty that lasts.

And because aluminum is lighter in weight, shipping and installation costs can be lower. Roof-top installations, especially, can be simpler, less expensive with the new Allis-Chalmers switchgear units.

Allis-Chalmers new aluminum-clad outdoor substation units are an important engineering achievement in electrical equipment design—an achievement which means lower costs, more lasting beauty for utility and industrial substation installations. Reynolds is proud to have played a role in this important development, providing both aluminum and aluminum know-how. For details on any electrical equipment using aluminum enclosures, contact your nearest Reynolds Sales Office or write *Reynolds Metals Company, Richmond 18, Virginia.*

REYNOLDS ALUMINUM

Watch Reynolds TV shows—**"ALL STAR GOLF,"** **"BOURBON STREET BEAT,"** and **"ADVENTURES IN PARADISE"—ABC-TV**

Electric heat boom in

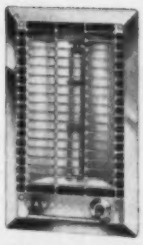
Golden 60's

OFFERS FAST GROWTH FOR YOU!

CAVALIER Baseboard Heat
115 V Duplex Outlets • End Caps
Built-in Thermostat • Corner Piece

Cavalier
AUTOMATIC
ELECTRIC HEAT

CAVALIER
Wall Insert
1 to 5 KW



CAVALIER Bathroom
Automatic and
non-automatic
120 and 240 volt

CAVALIER
Radiant
Cable

CAVALIER Portable
2, 3, 4 KW

HEAT BETTER ELECTRICALLY

Forecasts say that more people will have more money than ever before . . . 1960 personal income is estimated at 395 billion dollars . . . an all time high.

People spend money for the things they want . . . and they want Cavalier Automatic Electric Heat — the cleanest, most convenient, carefree, safest heat ever devised. It is easily installed in new or existing construction. Right now, people are making their plans to build or remodel as soon as the weather opens up. Now is the time for you to get your share of this big extra volume . . . and if you'd like some merchandising help, all you have to do is ask us.

Electric heat has made faster gains than any other heating method. In 1959 electric heat made another giant leap ahead . . . for 1960 even more utilities plan hard hitting promotions.

Cavalier, a pioneer in electric heat, has a complete line, thoroughly engineered, developed and refined by years of use all over the U.S. Cavalier builds to highest quality standards, stays ahead of competition by research and proven new designs.

All the leading electrical magazines, trade associations and merchandising studies point out the exceptional opportunities for new volume and profits through sales and installation of electric heat equipment. If you would like help in getting started in this, simply let us know. A wealth of experience and merchandising service is available from Cavalier . . . and Cavalier sells only through trade channels.

QUALITY SINCE 1865

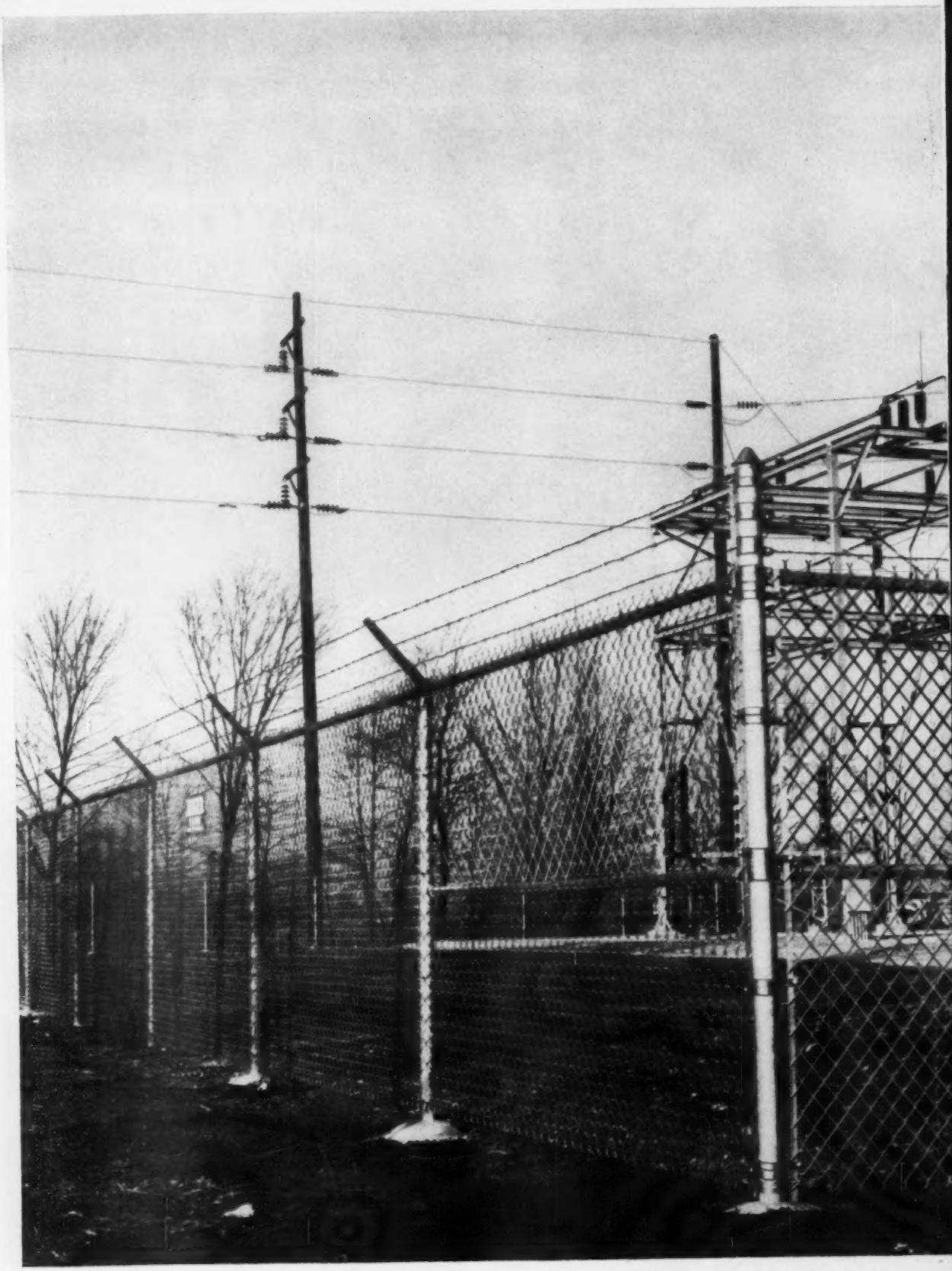
Highest Quality Electric Heating Equipment sold only through trade channels to safeguard the consumer, the contractor and the distributor.

CAVALIER CORPORATION
ELECTRIC HEATING DIVISION
CHATTANOOGA 2, TENNESSEE

NEMA

FIRST

- *in quality construction*
- *in engineering advances*
- *in safety*
- *in sales making features*



Cost comparison leads Dayton Power and Light Company to Alcoa Aluminum Chain Link Fence

Today's high costs for painting and other maintenance are causing progressive public utilities to re-examine the long-term cost of protecting their properties with chain link fence. A major Midwestern gas and electric utility, The Dayton Power and Light Company, of Dayton, Ohio, recently selected Alcoa® Aluminum Chain Link Fence for erection at two installations.

Alcoa engineers working with utility engineers approached the long-range evaluation in this manner:

OBJECT: To find a fencing material which will provide adequate protection at reasonable initial cost and will retain its strength, appearance and durability with minimum maintenance.

DATA:

Considerations	Galvanized Steel Chain Link Fence	Alcoa Aluminum Chain Link Fence
Height	7 ft	7 ft
Wire size	9 gage (0.148 in.)	9 gage (0.148 in.)
Appearance	Grayer than aluminum when new. Periodic maintenance necessary to retain original appearance.	Brighter and shinier than steel when new; protective oxide coating resists corrosion, retains silvery finish. Never needs painting.
Material cost per lineal foot (delivered price)	$2.25	$2.66
Painting cost* per lineal foot (at end of 10-year period)	1.35	—
Total cost after 10 years (per lin. ft)	3.60	3.38†
Total cost after 20 years (per lin. ft)	4.95 (min.)	4.10

*Based on total cost of wire brushing, cleaning, prime coat and finish coat, the minimal amount of maintenance necessary to retain strength and appearance of steel, plus escalation at 3½ per cent per year (includes labor, transportation and material).
†Includes interest of 16 per cent on premium involved in initial investment.

CONCLUSIONS: Aluminum chain link fence retains strength and appearance without painting. Maintenance of steel fence offsets initial premium paid for aluminum.

RECOMMENDATION: It is suggested that aluminum chain link fence be specified for all new installations. Further, that replacement with same be considered before any existing steel fence is again painted.

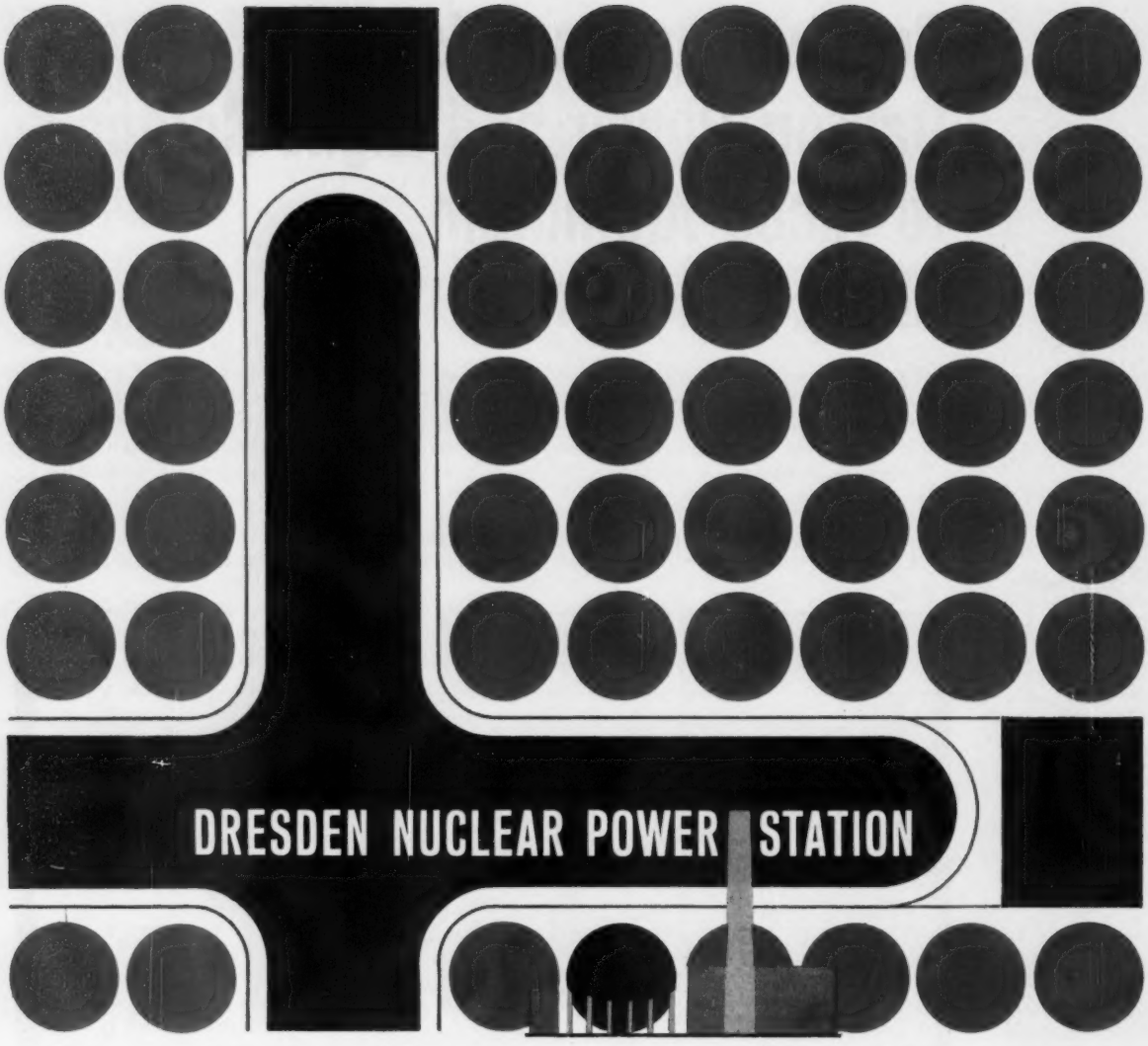
The Dayton Power and Light Company had Alcoa Aluminum Fence erected before construction began in order to safeguard valuable equipment.

◀ **The Dayton Power and Light Company** chose Alcoa Aluminum Chain Link Fence for this new electric substation at Centerville near Dayton, Ohio. Aluminum Fence Company of Cleveland was the supplier.

WRITE FOR FREE SUBSTATION FENCE SPECIFICATIONS: Alcoa's Standard Substation Specifications give all the details you need to evaluate and specify aluminum chain link fence for your own installations. Just write: Aluminum Company of America, 2055-B Alcoa Building, Pittsburgh 19, Pa. Or call the Alcoa sales office nearest you. You'll find it listed in the Yellow Pages of your telephone directory under "Aluminum."

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

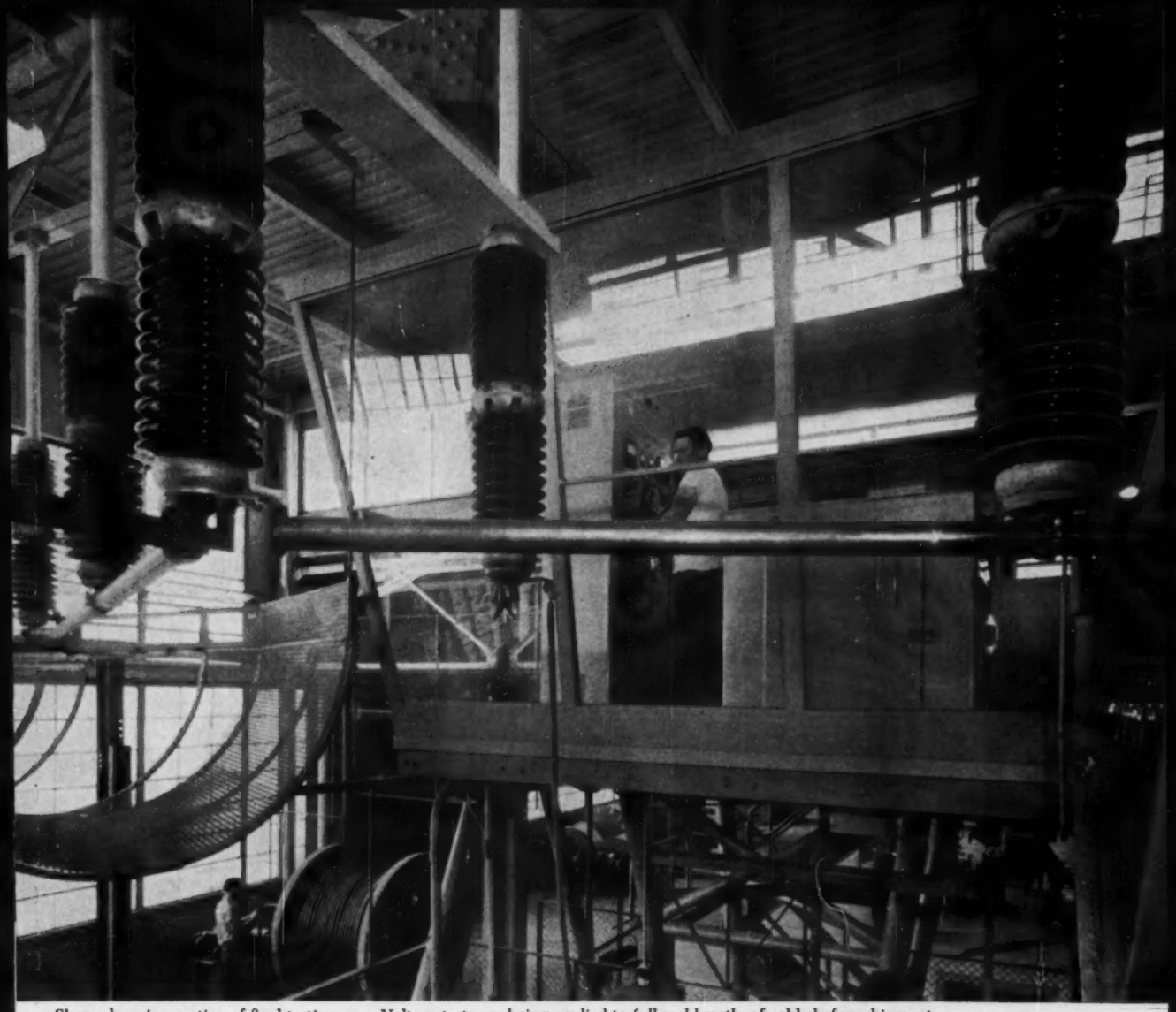


FUELED WITH 60 TONS OF MALLINCKRODT URANIUM

This reactor, as well as those of Yankee Atomic Power Company and Consolidated Edison Company, depends upon commercially produced nuclear fuels. The uranium loading of all three will be entirely or in part Mallinckrodt UO_2. ◆ As the roster of reactor projects grows . . . so does the number of Mallinckrodt nuclear customers. Whether power, propulsion or experimental—domestic or overseas—Mallinckrodt has unequaled experience in producing nuclear fuel materials. ◆ The core loading of Dresden, designed and fabricated by General Electric Co., will be 136,000 pounds of UO_2 (1.5% enrichment) . . . equal to approximately 1,800,000 tons of coal. This 180,000-kilowatt plant will be owned by Commonwealth Edison Company. ◆ Mallinckrodt produces more than fifteen different forms of uranium compounds and metal. Now, with the completion of an automated pellet plant, Mallinckrodt can deliver completed fuel elements by working with metal fabricators. ◆ For consultation on nuclear fuel problems write or call Mallinckrodt.

MALLINCKRODT NUCLEAR CORPORATION • ST. LOUIS 7, MO.

THE WORLD'S FIRST AND LEADING PRODUCER OF NUCLEAR FUELS



Shown here is a section of final testing area. Voltage tests are being applied to *full reel lengths* of cable before shipment.

ANOTHER BIG REASON WHY YOU SHOULD CONSIDER ANACONDA BUTYL (AB) CABLE—

SPECIALIZED QUALITY CONTROL AND INSPECTION

From the start: Raw-material suppliers are required to submit certified test reports. Then, tests and sampling at our plant offer extra protection even before production begins. **To finish:** Here's the final inspection line where the finishing touches are applied and where every inch of cable is carefully inspected. Perhaps you already know that Anaconda test procedures are much above industry standards. But do you know that test voltages on Anaconda Butyl (AB) Cable are 125% of industry standards—that minimum corona level is 150% of rated voltage to ground?

Quality control at Anaconda is *more* than mere testing and inspection. It is built into every manufacturing step. That's why you can be sure your Anaconda cable will be of high quality—why you can be sure Anaconda Butyl (AB) Cable is the finest rubber-insulated cable you can buy.

Everything you need to know about Anaconda Butyl (AB) high-voltage cable is neatly summed up in a new booklet, DM-5903, "Anaconda High-Voltage Durasheath* Cable." For your copy, write to: Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y. *Reg. U.S. Pat. Off. 60230

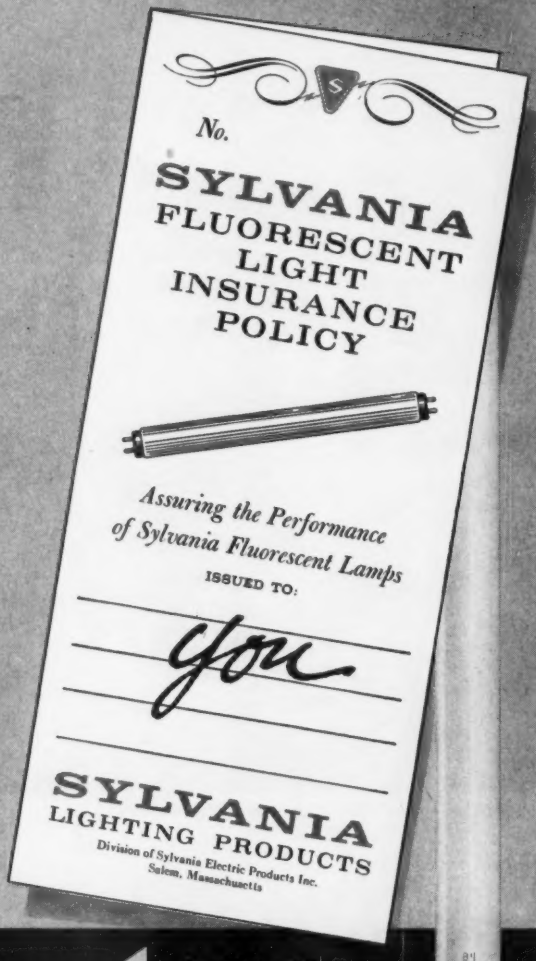
ASK THE MAN FROM

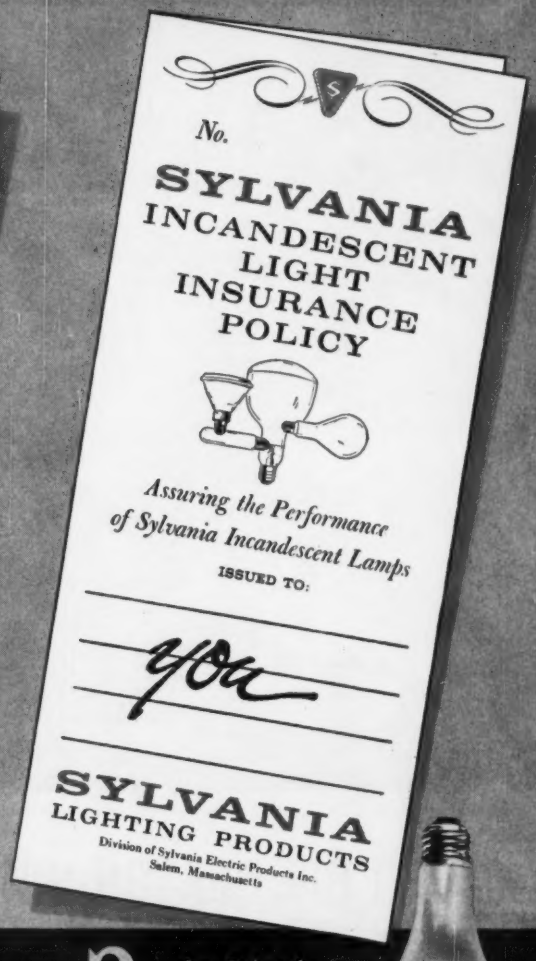
ANACONDA®

ABOUT BUTYL (AB) HIGH-VOLTAGE CABLE

Now Sylvania issues 4

AND YOU ARE





1 for Sylvania Fluorescents

2 for Sylvania Incandescents

How can Sylvania *do* a thing like this? Issue one insurance policy after another to *guarantee* that you get maximum lighting value . . . or your money back! Simple!

Because Sylvania in one lighting product after another *consistently* gives you the lowest TCL—Total Cost of Lighting—of any brand. (TCL equals cost of lamp or starter plus power plus maintenance.)

Because Sylvania lighting engineers *consistently* break the TCL barrier to bring you *more light* for less cost.

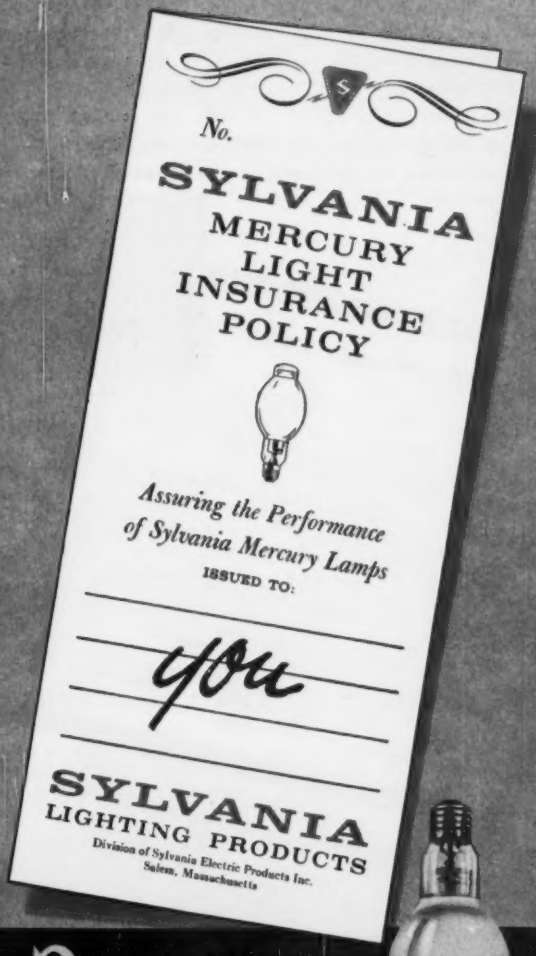
Because Sylvania—through its outstanding research and development—has been *consistently* out front in superior lighting.

There's just no question that Sylvania lighting products *do* provide top performance and will keep right on doing it! (You don't think we *want* to return your money, do you?)

Next time you buy Fluorescents, Incandescents, Mercury Vapor Lamps, or Starters, be sure your representative or supplier gives *you* your exclusive Sylvania Light Insurance Policy. Or write us: *Sylvania Lighting Products, a Division of Sylvania Electric Products Inc., Dept. 64, 60 Boston Street, Salem, Massachusetts. In Canada: Sylvania Electric (Canada) Ltd., P. O. Box 1190, Station "O," Montreal.*

light insurance policies...

THE BENEFICIARY!



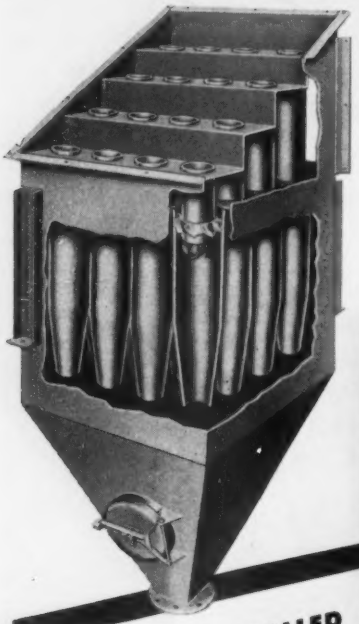
3 for Sylvania Mercury Vapor Lamps

4 for Sylvania Starters

SYLVANIA

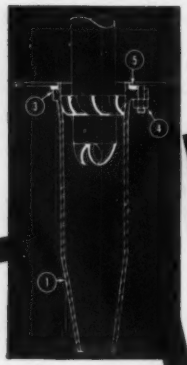
Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

13 BIG REASONS WHY MULTICLONE FLY ASH COLLECTORS



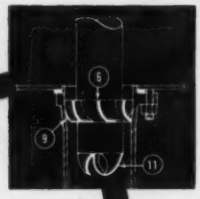
✔ COST LESS TO MAINTAIN...
✔ ARE FAR SIMPLER TO SERVICE!

When you buy fly ash collection equipment, don't stop with a comparison of *initial* cost only. Compare also the cost and simplicity of keeping your collector at top-notch efficiency *throughout the years.* To the outstanding advantages of Multiclone's unique operating features, add the low cost and easy maintenance of this equipment and you'll see why Multiclones are the leading choice wherever *centrifugal* types of fly ash collectors are the most practical solution.



EASILY INSTALLED COLLECTING TUBES

1. **CAST IRON TUBES** assure long wear!
2. **SPECIAL ALLOY TUBES** (FBA Inco #40, Chromehard and Ni-Hard) can be supplied where high temperatures or severe erosion are problems!
3. **TUBES ARE PRECISION-CAST** for exact fit into tube sheet. Tube lip protects sealing gasket!
4. **TIGHT LEAKPROOF FIT** of each tube is maintained indefinitely by special lock nuts!
5. **GAS-TIGHT JOINT** between tube sheet and each tube is assured by special gasket. Joint can be easily renewed when replacing tube!



PRECISION CAST VANES!

6. **CAST IRON VANES** resist erosion!
7. **SPECIAL ALLOY VANES** (FBA Inco #40, Chromehard and Ni-Hard) can be supplied where high temperatures or severe erosion are problems!
8. **VANES ARE EASILY INSTALLED** by simply dropping new ones into place when changing collecting tubes!
9. **EXACT FIT OF EACH VANE** in the tapered collecting tube prevents erosive "blow-by"!
10. **CAPACITY AND EFFICIENCY** of the unit can be quickly altered by simply changing vanes. Assures easy adaptability to new operating requirements—big savings in plant modernization programs!
11. **SPIROVANES** (energy recovery devices) may easily be added to outlet tubes of existing installations to increase capacity or reduce pressure drop!

Plus These Important Advantages...

12. **CUBIC SHAPE** of Multiclone is easier to install and insulate — and requires only ONE simple inlet and outlet duct!
13. **BACKED BY OVER 3300 INSTALLATIONS** serving a wide cross-section of industry, each Multiclone benefits from the unequalled "know-how" gained during Western Precipitation's **half-century** of leadership in the highly-technical field of modern fly ash collection!

Compare the above advantages with any competitive equipment and you'll readily see why Multiclones are the logical choice for *your particular* operations, too. There's a Multiclone representative near you who will gladly supply further details to fit your individual requirements. No obligation, of course!

Send for descriptive literature on Multiclone equipment.

COTTRELL Electrical Precipitators
MULTICLONE Mechanical Collectors
CMP Combination Units
DUALAIRE Jet-Cleaned Filters
THERM-O-FLEX Hi-Temp Filters
TURBULAIRE-DOYLE Scrubbers
HOLO-FLITE Processors
HI-TURBIANT Heaters

WESTERN
PRECIPITATION
CORPORATION

Engineers and Constructors of Equipment for Collection of Suspended Material from Gases . . . and Equipment for the Process Industries

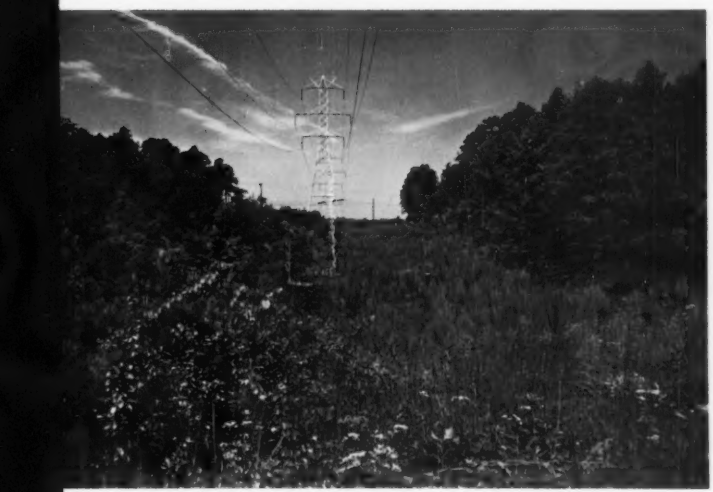
LOS ANGELES 54 • NEW YORK 17 • CHICAGO 2 • PITTSBURGH 22 • ATLANTA 5 • SAN FRANCISCO 4

Representatives in all principal cities

Precipitation Company of Canada Ltd., 8285 Mountain Sights Avenue, Montreal 9

Brush was sprayed on this right-of-way with "Ammate" X in an emulsion of oil and water. L. A. Killough, manager of the Pioneer Electric Cooperative, Greenville, Alabama, shows the brush control that existed three months later.

This photo illustrates how non-volatile "Ammate" X can be used without damage to nearby sensitive crops. It was taken 45 days after the brush at left was sprayed with "Ammate" X. Note the contrast between the dead brush and the vigorous tobacco adjacent to it.



Here again, "Ammate" X provided excellent brush control along the Duke Power Company's 230 KV line, River Bed Plant near Charlotte, N.C. Left area was cut and not treated; right area was cut and treated.

Users know Du Pont AMMATE® X controls brush for years, without crop injury

Du Pont "Ammate" X weed and brush killer provides long-term brush control that is effective and highly economical. "Ammate" X reduces brush control costs because just one spraying gives a high percentage of kill. And, usually, only occasional "spot" treatments are needed in subsequent years. There's no danger to nearby sensitive crops with "Ammate" X because it is non-volatile.

On all chemicals, always follow label instructions and warnings carefully.

DU PONT
REG. U. S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

Weed and Brush Killers

AMMATE® X
weed and brush killer

TELVAR®
monuron weed killer

KARMEX®
diuron weed killer

DYBAR®
fenuron weed and brush killer

TRYSBEN® 200
weed killer

"Dybar" applied to brush on transmission line of Central Illinois Public Service Company killed brush in foreground; background, untreated.

New!

Brush control with dry pellets— use Du Pont DYBAR®

FENURON WEED AND BRUSH KILLER

Here's a new and easy way to control brush—just spread dry pellets—use Du Pont "Dybar" fenuron weed and brush killer as it comes from the container. For areas difficult to reach, you can even spread "Dybar" by plane or helicopter. "Dybar" kills plants through the roots. One treatment usually gives positive brush control of a wide variety of woody species. And because "Dybar" is non-volatile, there are no fumes to endanger nearby sensitive crops. "Dybar" is also non-flammable, non-corrosive to equipment and low in toxicity to man and animals.

You can also cut maintenance costs around areas where grass and weeds are a problem with Du Pont "Telvar" monuron and "Karmex" diuron weed killers.

On all chemicals, always follow label instructions and warnings carefully.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

Weed and Brush Killers

AMMATE® X	TELVAR®	KARMEX®	DYBAR®	TRYSBEN® 200
weed and brush killer	monuron weed killer	diuron weed killer	fenuron weed and brush killer	weed killer

A-12641

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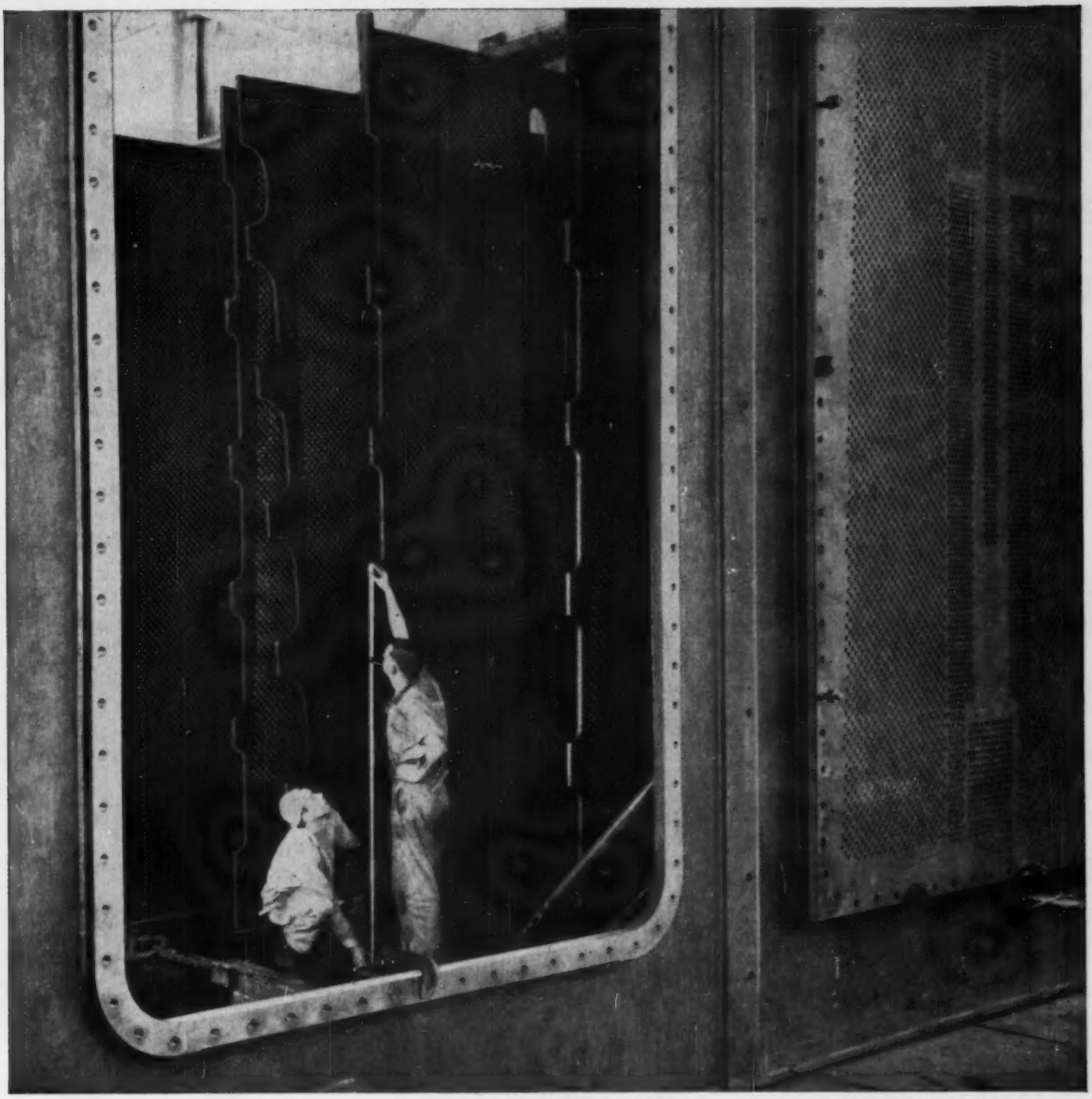


Twin-shell, triple-lane, single-pass Condenser with 187,000 sq. ft. capacity. One of largest units ever built, it was recently installed at large eastern utility.

In tube layout, too... design makes the difference with C. H. Wheeler condensers

You see here one of the many reasons why C. H. Wheeler Dual Bank Surface Condensers operate so efficiently in scores of public utilities and industrial plants throughout the country.

Triple Lane Tube Layout, with three separate pathways for steam travel, allows the steam to penetrate to the peripheries of all tubes.*

Design like this, typical of C. H. Wheeler engineering, steps up condenser efficiency. Other engineering advancements—such as patented Reverse Flow, which permits flushing away leaves, twigs, algae and other foreign matter—reduce maintenance requirements. "Zero" condensate temperature depression, pure condensate and deaeration to 0.03 cc. of oxygen per liter (special design provides for deaeration to 0.01 cc. of oxygen per liter) . . . are additional features you get with C. H. Wheeler Condensers.

**Location of the air-vapor take-off reduces the resistance to steam passage. This minimizes the depth of steam penetration through the tube bank of all C. H. Wheeler Condensers.*

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue • Philadelphia 32, Pennsylvania

Whenever you see the name C. H. Wheeler on a product, you know it's a quality product

Steam Condensers • Steam Jet Vacuum Equipment • Centrifugal, Axial and Mixed Flow Pumps • Marine Auxiliary Machinery • Nuclear Products

SOUTHERN STATES OFFERS THE MARGIN OF SAFETY NEEDED IN AIR SWITCHES TODAY AND TOMORROW

The switches shown here are brand new. They will pass any industry standard short circuit test with ease.

But what about 10 years from now, when the switches are covered by grime and grit; when operation has caused some wear of the contact surfaces?

What's going to happen *then*, when heavy fault currents occur? Are the critical current interchange points going to stand up to the task of protecting your valuable load?

These are questions that must be answered by engineers concerned with today's complex transmission and distribution problems. Basic switch design, quality of construction, and the type of contacts used deserve critical appraisal. The contact is most important.

Southern States provides extra security for its air switches by using Amplitact® contacts. Since this contact was introduced about 10 years ago, *not a single one has ever failed under short circuit.* This is the margin of safety you need.

Look beyond the catalog and technical data—look to the future capabilities and trustworthiness of the switch you buy.

High density, high load areas demand maximum protection against higher values of fault current. That is why so many utilities throughout the nation are using Southern States Air Switches with Amplitact Contacts.

Get the facts from your Southern States representative, or write direct for details.

SHORT CIRCUIT TESTS OF SOUTHERN STATES SWITCHES EQUIPPED WITH *AMPLITACT* ® CONTACTS

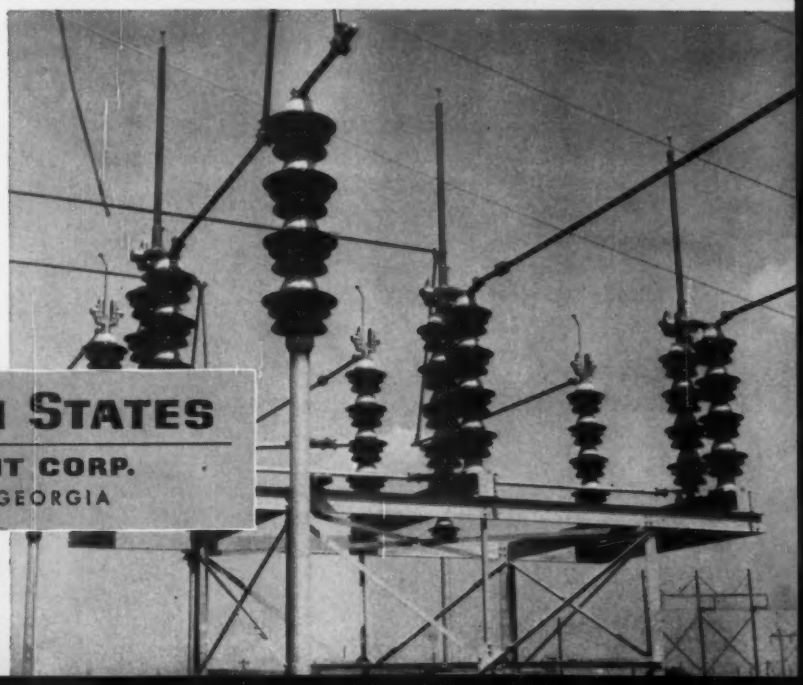
KV	CONT. CURRENT RATING	TEST SHOTS			TEST RESULTS
		NO. OF TESTS	RMS AMPERES MAXIMUM	RMS AMPERES MINIMUM	
161	1200	12	62,900	51,200	No Damage
		6	79,000	60,000	No Damage
		6	80,300	69,700	No Damage
		9	84,500	74,600	No Damage
		9	98,000	78,400	No Damage
		3	106,800	89,800	Pressure Marks*
161	2000	7	70,500	58,600	Pressure Marks*
161	1600	8	70,000	53,700	No Damage
		1	114,000		Pressure Marks*
		6	82,000	65,300	Pressure Marks*
161	1600	5	106,100	99,500	Pressure Marks*

**The term "Pressure Marks" should in no way be construed as an indication of damage to the contact. Instead it points up the extremely high contact pressures which were developed by* AMPLITACT® *and were anticipated in the design of this type contact.*

KEEP PACE ELECTRICALLY

ABOVE Consolidated Edison's Buchanan Substation is shown here during construction. Southern States' 161 KV—2000 amp Type RDC double side-break switches and 230 KV—1600 amp Type WAG switches (not shown) are the Amplitact equipped air switches used on this station.

AT RIGHT Houston Lighting & Power Company uses 161 KV—1200 amp Type WAG air switches on this modern substation.



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EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

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HAVE EVERYTHING...INCLUDING COMPACTNESS!

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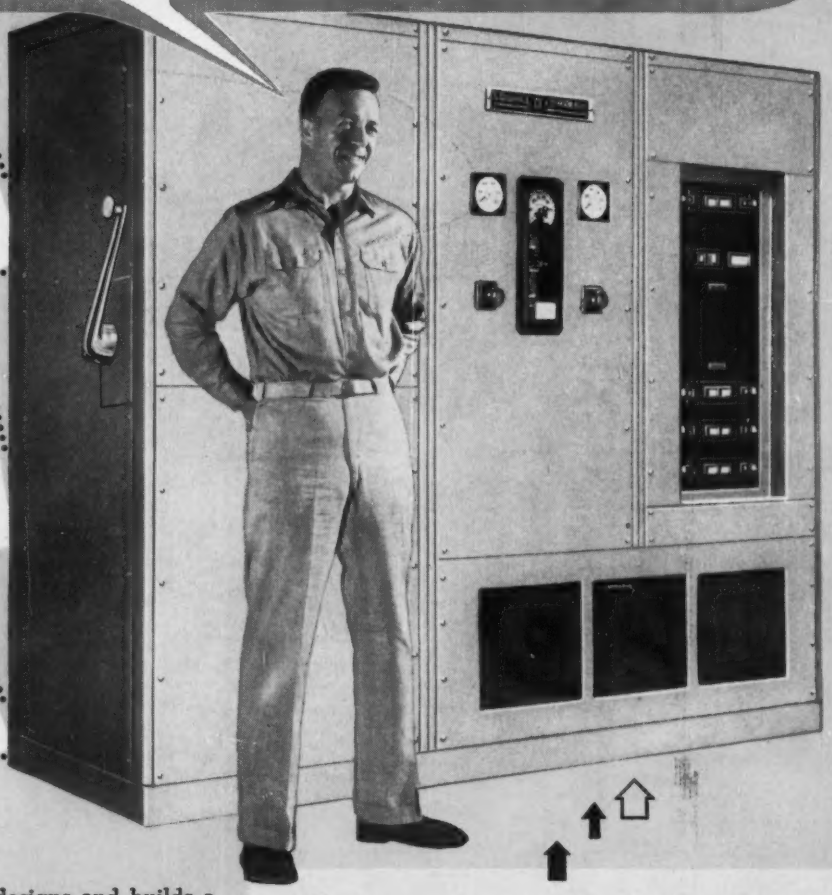

• Square D designs and builds a complete line of substations for any application, indoor or outdoor—with dry or liquid-filled transformers—with large air-breakers or molded case breakers—with motor control units.

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Power-zOne DESIGN PAYS OFF!

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EQUIPPED TO BEST FIT YOUR APPLICATION

- **High Voltage** • Air interrupter switch or oil cutouts, fused or unfused
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- **Low Voltage** • Molded case circuit breakers; QMB fusible switches and motor starters; metering equipment. Full 72" of panel space available for these devices

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POWER CABLE INSULATED WITH MONSANTO POLYETHYLENE

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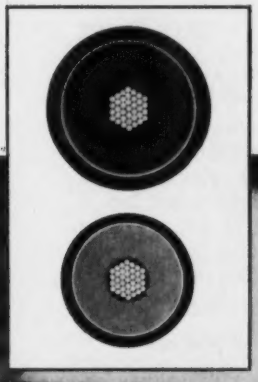
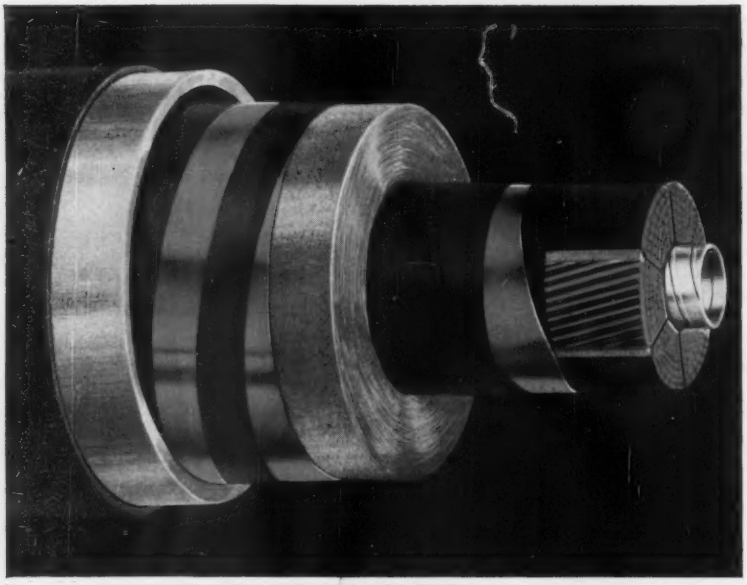


New 15,000 volt polyethylene-insulated power cable installation at main sub-station, Monsanto Plastics plant, Springfield, Mass. Installation-rated at 175 amps, 15,000 volts. 3-phase system, 1 conductor per phase. Conductors are 133,100 circular mil copper, with 37 strands. Insulation: 1 layer black fiberglass tape, 297 mil polyethylene insulation, metal shielding, 6/64″ vinyl jacketing. Note inset: the slim shape and size of the polyethylene-insulated cable (lower), compared to the old cable (upper) being replaced.

DEVELOPED FOR JOINT AEIC-EEI HIGH VOLTAGE CABLE PROJECT AT CORNELL UNIVERSITY...

New Phelps Dodge High Pressure Oil-filled 345 KV Cable System

Combines the advantages of low pressure oil-filled cable with those of pipe-type cable



Phelps Dodge Copper Products Corporation has designed a completely new 345,000 volt high pressure, oil-filled power cable for a special high voltage project being sponsored jointly by the Association of Edison Illuminating Companies and the Edison Electric Institute. The test project will be conducted by the Electrical Engineering Department of Cornell University's School of Engineering at Ithaca, N. Y. Three other leading American cable manufacturers are also submitting cable systems for the project.

Objectives of Project

The AEIC-EEI project has two main objectives. Primarily, it is aimed at developing the most practical cable systems for economically transmitting huge blocks of electric power—particularly in the extra-high voltage ranges that American utilities will have to handle in the near future. The project is also intended to

CABLE SPECIFICATION

Voltage	345 Kv.
Rating	500 Megawatts
Load factor	90%
Loss factor	85%
Installed in concrete duct, spacing, center to center	9 in.
Ambient earth temperature	25°C
Conductor temperature, normal	75°C
emergency	90°C
Nominal shipping length	1000 ft.
Cable construction	
Steel spiral hollow core I.D.	0.69 in.
Six segment compact segmental conductor	2000 MCM
Graded 1 to 6 mil wood pulp paper insulation	1035 mils
Seamless tubular aluminum sheath	220 mils
Extruded high density polyethylene jacket	120 mils
Overall diameter	4.68 in.
Nominal operating pressure	200 psig.
Joints	Mechanical
Potheads	Condenser type
Oil Supply	Central pumping plant

TESTING SPECIFICATION

Power factor at 90°C	below 0.25%
Power factor at 100°C	below 0.30%
Ionization factor	Minimum
Sixty cycle voltage tests to ground	
Full reel	300 Kv.
Sample withstand tests,	
6 hour	373 Kv.
one minute	680 Kv.
Impulse withstand voltage test to ground (1½ x 40)	
at 75—90°C with splice	1175 Kv.
At ambient with potheads	1300 Kv.
Load cycle test, 290 Kv. to ground, 110°C copper	Stable

This "production line" was set up to fabricate cable in Phelps Dodge plant. Note oversize reel in background.

demonstrate the ability of American cable manufacturers to design and fabricate power cables with ratings of 345 KV and up. It is hoped, too, that the project will serve to stimulate interest in this field among student engineers.

Phelps Dodge's decision to design an aluminum-sheathed, high pressure, oil-filled cable to carry as much as 345 KV was based upon careful consideration of the project and a thorough exploration of all feasible materials. The comprehensive knowledge and extensive experience of Phelps Dodge in this highly specialized field, together with the ultra-modern research facilities available to Phelps Dodge engineers, played a major part in determination of the final cable design.

Combined Advantages of Cable

This design combines desirable features of the pipe-type cable with those of the low pressure oil-filled cable. In appearance, the aluminum sheathed cable is like the conventional oil-filled cable, but, like a pipe-type cable, it is operated at an oil pressure of 200 psi., using a small oil pump system equipped with oil treating accessories.

Thus the cable has the features of a pipe-type cable, enabling long lengths to be installed, together with the insulation security due to high pressure, and the ability to freeze the oil for repairs of buried cables.

It also has the advantages of a low pressure oil-filled cable, including complete protection of the insulation from air and moisture, ability to be used in a duct system, and absence of conductor size limitation from the magnetic effects of steel pipe.

A distinctive part of this Phelps Dodge cable is a special paper insulation developed after intensive evaluation studies in a paper laboratory set up by Phelps Dodge for this project. The new paper uses carefully selected pulps made with filtered and de-ionized water. A newly developed commercial oil, resulting from Phelps Dodge's continuous 30-year oil research program and close liaison with a petroleum company, is another unusual part of the cable system.

Prototypes Built

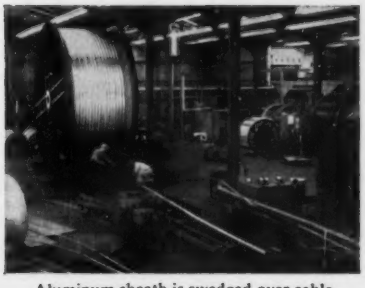
Phelps Dodge engineers first fabricated several full scale prototypes of the cable by building in progressive stages to 161,000 volts, 230,000 volts and, finally, 345,000 volts. These prototypes then were thoroughly tested in Phelps Dodge's modern high voltage research laboratory with impulse voltage, accelerated aging load cycle and 60-cycle extra-high voltage tests. The cable and joint were also given a manhole bend test. Because of the extremely high voltage of the cable, new types of high pressure condenser potheads were developed by two accessory manufacturers in collaboration with Phelps Dodge engineers.

At Ithaca, all the cables in the project will be placed underground in applications that will simulate, as nearly as possible, actual in-service conditions. During the project these same in-service conditions will be maintained as closely as environment allows. All cables will be subjected to high voltage measurements periodically with close cable monitoring to record performances.

The development of this new 345 KV cable system is another tangible result of Phelps Dodge's thorough knowledge and pioneering research, supplemented by close contact with the latest European advances in the electric power transmission field. It illustrates why Phelps Dodge enjoys a reputation for progressive leadership in modern power cable fabrication.

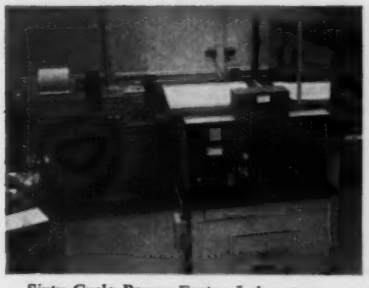
PHELPS DODGE COPPER PRODUCTS CORPORATION
300 Park Avenue, New York 22, N.Y.

PD

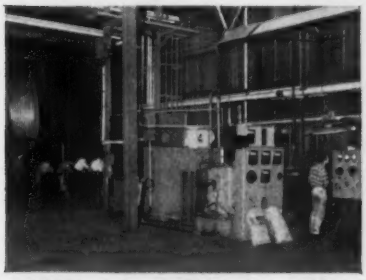


Aluminum sheath is swedged over cable prior to placing cable on mammoth 19-foot reel.

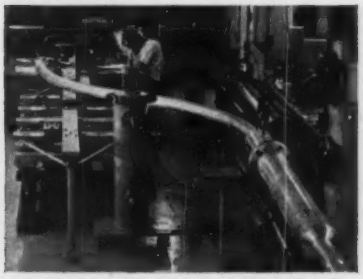
Exacting high voltage tests are applied to 345 Kv. cable system in Phelps Dodge high voltage research laboratories.



Sixty-Cycle Power Factor Laboratory, where components were given electrical tests.



Final step was extruding polyethylene outer jacket over 345 Kv. cable.

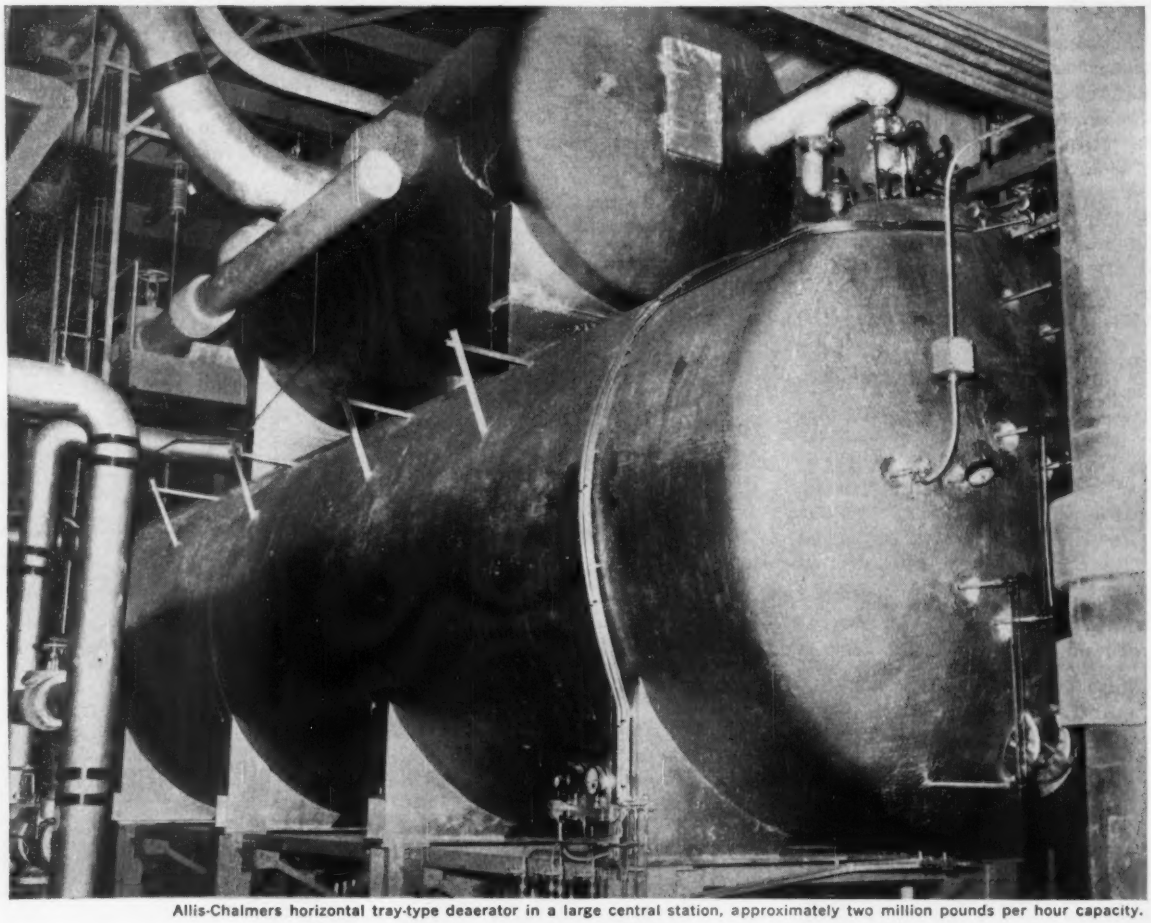


Prototype cable and joint undergo manhole bend test in Phelps Dodge laboratories at Yonkers, N. Y.

Special Paper Test Laboratory played important role in development of cable insulation.

ALLIS-CHALMERS

A-1221



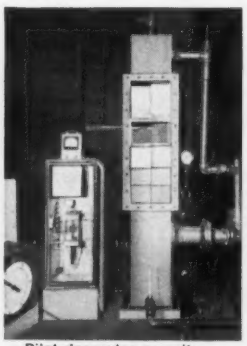
Allis-Chalmers horizontal tray-type deaerator in a large central station, approximately two million pounds per hour capacity.

Iron and Copper pick-up minimized

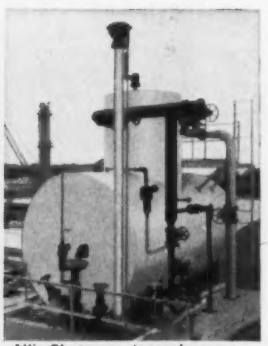
when you switch to Allis-Chalmers deaerators

Positive corrosive gas removal by Allis-Chalmers tray-type deaerators is proved by a pilot unit (below) equipped with a continuous oxygen analyzer and recorder. It utilizes unique counterflow design for thoroughly scrubbing dissolved gases from the water surface. Design produces maximum heating of water with minimum of steam loss in venting. Effective deaeration is guaranteed under all loads, minimizing iron and copper pick-up.

Ruggedly constructed, A-C deaerators employ 16-gauge 18-8 stainless steel on all equipment exposed to corrosive gases. No moving parts assures quiet operation, minimum maintenance. Inspection is easy through ample access doors and manholes. Service? Seventy-seven district offices throughout the nation. Your A-C water conditioning engineer can give you full deaerator details. **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.



Pilot deaerator permits evaluation of tray designs.



Allis-Chalmers deaerators may be installed indoors or outdoors.

Editorial Comment

FEBRUARY 15, 1960

CIGRE: An Investment in Professional Progress

Once again this year, power system engineers all over the world will gather at Paris in June for the biennial session of CIGRE, the International Conference on Large Electrical Systems.

This CIGRE conference promises to be among the most important in years since it will review recent rapid progress in the design, construction and operation of electric power systems around the world. Special emphasis will be given to studies of system stability, surges and lightning protection, and underground cable. There will be reports on extra-high voltage lines, as well as circuit breakers, generators and transformers.

Seventeen U.S. engineers, representing electric utilities, consulting firms, and electrical manufacturers, will author eight of the 130 scheduled technical papers. This year something over 50 American engineers, or about 16% of national membership in CIGRE, will attend.

The sad fact is that too few of the non-member stay-at-homes appreciate what membership in such an international engineering organization can contribute. In the case of CIGRE, its surprisingly low-cost membership brings these conferences home to those who can't attend, in the form of English translations of technical papers. But beyond the mere procurement of papers, membership in an international technical society can be a professionally rewarding experience. It can broaden the grasp of engineering problems at home, strengthen appreciation of the need for international cooperation in standardization matters, and go far to squelch our reputation abroad for provincialism in engineering matters.

Let's Fish or Cut Bait on National Electrical Week

From Rotary Club speeches to generating plant tours, considerable work went into this year's observance of National Electrical Week (EW, Feb. 8, p 34). But we can't avoid the uneasy question of whether the whole thing was worth it.

In Cleveland, a coordinated, well-publicized, generously budgeted program found Cleveland Electric Illuminating Co and General Electric Co involved in activities that may well have achieved lasting public relations benefits. But a myopic program in a Northwest state failed to arouse even the industry's interest.

Let's face it: The American public is surfeited with special "weeks," and tends to shrug them off as another attack on the pocketbook. So the planning of a successful "week" has to be superb, and coordination exquisite. NEW hasn't met these specifications.

NEW this year wasn't a bust; but it was just another "week." Efforts across the nation took so many paths that the net effect lacked unity.

The CEI-GE effort focused on school children. Some 2,500 went through NELA Park; prizes were offered high-school newspaper editors; there was a strong tie-in with Science Youth Day, with plant tours and demonstrations.

We need youth on our side. And we have a long-term, recognized franchise in National Electrical Week. Why not tie the two together, focus on youth, and achieve unity of purpose on a national scale at the same time?

NEW can be an extremely important segment of the industry's PR efforts. It should be coordinated and guided to this end, or it should be dropped.

COLE

COVELL

BUTLER

Price vs Value Is

Purchasing men question pricing structures and basis of escalation formulas. Manufacturers call attention to 'hidden values' and promise economies from advanced buying

A purchasing man returning from the Public Utility Buyers Group conference held in Atlanta earlier this month may well have submitted the following summary of the meeting to his boss:

Best bargains: A scholarly paper on escalation and comments of various speakers on recent changes in escalation charges as they apply to heavy electrical equipment.

Readily available and worth considering: Sharp criticism of pricing structures, and spirited defense of product values.

In short supply: Any open debate on the various issues that come between buyer and seller.

In spotty supply: New ideas that will help utility purchasing men in their daily tasks.

Under-the-counter bargains: Veiled talk on possible outcome of the two grand jury investigations into pricing practices of electrical manufacturers.

This summary, while comprehensive, only hints at the real features of the two-day buyers conference which drew a record attendance of some 200 utility purchasing men and nearly 500 manufacturers and suppliers.

The "Current Escalation Practices" paper of O. D. Butler, assistant director of purchases of Commonwealth Edison Co, probably drew the most praise for its scholarly discussion of the subject. Concluded Butler:

"I believe we should encourage all those industries serving us, who by the nature of their products need some escalation protection, to accept an escalation formula that is built around the right per cent of the price, the right indexes, and the right time, then to share the cost, or benefit as the case may be, with their customers."

But the main event of the conference was a running commentary on the issue of "Price vs Value". The attack on prices and pricing structures was carried almost singlehandedly by George H. Cole, manager of purchases, Alabama Power Co. Upholding the value of their products and offering advice on how to get more value for a dollar were C. W. Mills, manager electric utility sales, Westinghouse Electric Corp; William S. Ginn, vice president, General Electric Co; and Donald S. Walker, vice president, Combustion Engineering, Inc.

To round out the program, Veteran Mark B. Covell, Supt of Supply Service, Union Electric Co, offered this advice to the buyers present:

- Stay as close as possible to nationally recognized specifications and to manufacturing industry standards—thus making possible economies for both the buyer and the seller.
- Put more time and thought into the selection of bidders—whether you are striving for broader competition or trying to restrict the number of suppliers.
- Negotiation of a purchase contract calls for close coordination

MILLS

GINN

WALKER

Main Issue at Buyers Conference

with other responsibilities in the company—especially engineering.

● Follow-through on a contract to see that terms are fully met is an important part of the purchasing function.

● In setting policies that would give priority to manufacturers or suppliers in your own customer area, it is well to distinguish between products actually manufactured in your service territory and those merely marketed by a firm in your area.

Not on the formal program, but still very much a part of the corridor conversations at the buyers conference, was discussion of the possible outcome of investigations being conducted by grand juries in Philadelphia and Milwaukee into the pricing practices of electrical manufacturers. Several buyers present wondered whether utility men might be called in to testify. One Buyers Group official said that the matter had been kept off the regular program because the National Association of Purchasing Agents, with which the Buyers Group is affiliated, strives to stay clear of all political activity.

One surprise came at the meeting when Cole indicated that he is more receptive to the pleas of manufacturers for advanced buying than he has been in the past. Said Cole, "I have been one of those who resisted this (advanced buying) in past pricing and escalation conditions. But, with prices and escalation, particularly in equipment, now on a more realistic basis, I think our organizations might well consider reasonably going along with this program, with hope that economies established will reflect in prices to us."

I. Pricing

It was the same Cole who carried the main attack against pricing structures, lashing out at what he called the "abuses" of uniform pricing practices. "We are concerned," he said, "about the increased artificiality in pricing practices." Cole put his complaints in the form of questions:

● When manufacturers sell directly to a utility — rather than through a distributor—shouldn't the economic differential (in the two methods of distribution) be reflected in the prices that are charged?

● "We recognize that it is advantageous and desirable to establish uniform prices at destination over a wide area on certain apparatus where the proportion of the cost at destination related to transportation is relatively small. But, there are certain other products on which there is a large differential in costs at destination based upon transportation, quantity, and other savings. In these cases, shouldn't the manufacturer pass on to the utility these savings or a substantial portion of the savings in prices quoted?"

● "We question the propriety of setting a unit price for a small quantity of certain items and then applying the same unit price to a much larger quantity in which economies of production and other economies are involved."

● "When we purchase condenser tubes . . ., the manufacturer or fabricator of the condenser tubes is permitted up to a 5% plus tolerance. A reasonable charge for the plus tolerance may be in order since a minus tolerance is not permitted under the specification. But, why should we be charged, if at all, at

the price of finished condenser tubes for the additional metal included for accommodation of the manufacturer rather than at most the cost of the metal, representative of maximum, if any, additional cost?"

● Shouldn't the buyer have a position in the application of prices advances in raw materials as they apply to the final prices on equipment previously placed on order?

II. Value

Three spokesmen for manufacturers on the program sought to convince the buyers that they are getting full value for their dollars, and went further to show ways of obtaining increased value.

Pointing to the technical improvements made in several lines of equipment, Mills, of Westinghouse, said leading manufacturers have helped save utilities real money. He noted that the maximum rating of pole-mounted transformers has increased from 50 to 500 kva. "This 500-kva unit replaces the pad mounted unit. The weight has been reduced 20%, losses are reduced, and the price is 20% less—to say nothing of the savings resulting from elimination of the pad mounting and related gear," Mills said.

In addition to the technical advances, Mills also stressed the "hidden values" which he named as "service back-up on equipment, engineering services for which no charge is made, nationwide warehousing facilities, training services and advanced study seminars of all sorts which are available to your professional people." "But most important," Mills continued, "is the product, itself . . . the fact that it has been pretested for reliability in service, so that your system isn't converted into a trial-and-error laboratory with consequent outages and the expense they entail.

Ginn, of GE, and Walker, of Combustion Engineering, also presented their case for the value of heavy generating equipment and boilers. Both went further, promising additional economies as a reward for more regular purchase of these heavy items of equipment.

If electrical utilities would purchase new generating equipment on the basis of the historical growth trend in the industry, rather than on the present cyclical basis, said Ginn, they could save more than $500 million during the next ten years.

Same True for Boilers

Walker applied the same reasoning to boiler purchases. He told the buyers: "Naturally advance buying goes a long way toward resolving our major purchasing problem . . . making the escalation dollar stretch. Take the case of advance purchasing of a duplicate unit if you will. Here we can place orders for outside purchased equipment within a few days of the contract date. In nearly all cases shipment can be made within 12 months and the equipment stored at the site. What does this mean dollar-wise? Well, assuming escalation amounts to 5% per year, we can save 7 to 8% over the average contract on which we take shipment in the middle or toward the end of the third year. On a million dollars worth of boiler this might be $75,000 . . . a goodly piece of change."

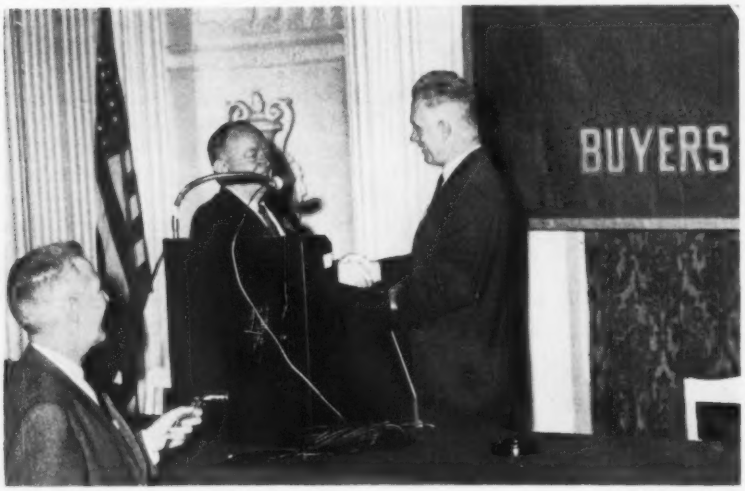
III. Escalation

In his extended discussion of escalation formulas and escalation clauses in purchasing contracts, Butler said, "The turbine-generator manufacturers about the middle of last year . . . took a step in the direction of assuming a share of responsibility for cost changes by shouldering the first 2½% increase that may occur in one year. However, they left the time feature in the formula that over-escalates unless the buyer wants to swap that for additional interest costs during construction. The step to take some responsibility for increasing costs is encouraging, if it doesn't defeat the original purpose of escalation, which is to promote the maintenance of a healthy competitive industry with a reasonably low profit margin for each transaction."

Butler also called attention to the recent proposal by some boiler manufacturers that escalation apply from the date of the proposal to an average index figure computed by arithmetically averaging the monthly figures during which shop fabrication was in progress and the month preceding start of shop fabrication.

In commenting on the proposal, Butler said, "This seems to be about as fair a way as can be found in practice to measure material cost changes and yet maintain simplicity. Labor cost changes are measured in the same manner except that the index for the month before start of fabrication is not averaged in."

Butler's discussion included an examination of various indexes used in escalation formulas, and an appraisal of their application to various lines of equipment. But Butler stressed that escalation clauses should never be used as a means of supplying funds for financing the producer's business.



OFFICERS AND HOST are (l. to r.) Robert B. Gear, Commonwealth Edison, incoming chairman; John R Carmichael, Georgia Power, local arrangements; and J. B. Homsher, Gilbert Associates, chairman

Utility-Market Fight: 1st Round Goes to Coal

Oil loses out as ICC examiner says railroads were justified in cutting freight rates to retain East Coast market

A battle of fuels over the big East Coast electric utility market is being waged at the Interstate Commerce Commission, and last week coal took the first round from residual oil.

An ICC examiner said that 56 coal-carrying railroads were justified in cutting freight rates to keep major Atlantic Coast utilities from switching to oil.

Oil men, represented by Empire State Petroleum Assn, a jobber group, are expected to appeal Examiner E. L. Boisseree's ruling to the commission before the March 1 deadline for filing exceptions.

The courts may finally decide the issue. In the meantime, the railroads and coal producers are continuing to supply the 9.4 million tons of coal annually to plants equipped to use both fuels.

Coal began to see its utility business slip in late 1958, and quickly spotted the cause: mounting oil imports and falling oil prices. The pinch came at the utilities on water, where tanker deliveries give oil the sharpest competitive edge.

Con Ed Deal Sets Pattern

Coal's deal with Consolidated Edison Co for the April 1, 1959, to March 31, 1969, fuel contract period set the pattern for the price cuts. At the start of 1959, Con Ed had to pay $10.53 a ton for coal, and could buy equivalent oil heat for $9.57. The utility put coal on notice that it stood to lose 2.5 million tons annually to residual oil.

Coal producers in the Appalachins cut their mine price 25¢ a ton. The railroads offered to cut rates for that part of the market that could be ousted by oil.

For Consolidated Edison, this figured to 50¢ a ton less on everything over 3 million tons, providing the utility uses 5.5 million tons in the 12-month period. Twelve other utilities, from Salem, Mass., to Baltimore were offered the same 50¢ cut, but with minimum requirements tailored to the amount of coal threatened by oil in each area.

The railroads say the plan will cost them about $5 million a year in revenue, but they say they faced a loss of $40 million with coal totally replaced. They will continue the cuts after this April 1 if competitive conditions warrant it.

Boisseree wasn't convinced by the jobber group's claim that a shortage of tankers and the mandatory oil import curbs, in effect since last March, together rule out obtaining the 40 million barrels of oil a year needed to rout coal.

The freight rate cuts wouldn't have been made, the examiner said, without "a very real threat of substantial loss of revenue." Boisseree said he was convinced that without the cuts, the financial stability of a number of the railroads would have been "seriously threatened."

The residual oil import quota "is presently fixed at a high level and is conditioned to some extent upon supply. If there is an increased demand, or an increase in the oil prices, the quota would undoubtedly be increased," he said.

He found no violation of ICC practice, or of the antitrust laws.

Utilities are expanding, he said, and even if coal holds its own in tonnage, "there will be a substantial area in which oil sales can be increased."

To ESPA's claim that coal's counterattack was monopolistic, Boisseree cited the positions of the two fuels in the disputed East Coast utility market for the first eight months of 1958 compared with that period last year.

Coal, he said, remained steady at 12.5 million tons. Residual oil, with the price of coal and freight rate cuts in effect for five of the eight months last year, gained 6.1 million barrels for sales to utilities of 18.7 million barrels last year, he said.

Hearings Begin on Co-op Tax Bill

The Treasury Department's proposal to tighten up on co-op income taxes met a chilly reception in hearings before the House Ways & Means Committee, Feb. 1-5. And chances for its passage, or similar legislation, are dim this year.

The proposed bill (HR-7875), introduced by the late Rep Richard Simpson (R-Pa.), calls for federal income tax payments by co-ops on their patronage refunds, unless the refunds are paid in cash or are made out as redeemable certificates.

Jay Glasmann, assistant general counsel for the Treasury, emphasized that the bill would not affect electric co-ops, which are exempted by the IRS code.

General Manager Clyde Ellis of the National Rural Electric Cooperative Assn agreed with Glasmann, but said he was in sympathy with co-ops opposing the bill.

Said Ellis: "It is true the proposed legislation does not forbid co-ops to operate if they fail to comply" with terms of the measure. "It is true the proposed legislation merely denies deductibility . . . By denying deductibility, the legislation would impose heavy tax burdens upon the cooperatives . . ."

Ellis pointed out that electric co-ops "had to be different" because of their need for long-term, low-cost capital. Electric co-ops are required to repay indebtedness to the government in 35 years, while power companies may re-finance theirs.

Ellis emphasized that co-op patrons should not be able to get at their portions of the co-op's net margin, because, if they could, the co-op would be destroyed.

Joseph J. O'Connell of the National Tax Equality Association charged that the bill has "serious shortcomings . . . The principal defect . . . is that it recognizes the long-discredited theory that a patronage dividend is a price adjustment of a transaction between the cooperative and his patron."

Vermont Bids for Niagara Power . . .

Legislation is passed that permits Public Service Commission to obtain energy for resale to co-ops and municipals; savings estimated at 5 mills per kwhr by private consultant's study

The Niagara Power Project's enabling legislation set forth two major points: **1.** Public bodies and cooperatives get preference and priority on the share of power allocated for rural and domestic use. **2.** Some of this power is available for use "within reasonable economic transmission distance in neighboring states . . ."

The state of Vermont has, with almost embarrassing speed, pushed legislation through that takes care of point No. 1, but it will take much longer to determine if the state is close enough to qualify for 50 Mw on the second item.

The new law gives the PSC authority to negotiate for purchase of Niagara power. Formerly the PSC had to resell without preference. Estimates on overall savings range from $1-$2.5 million a year.

Cost Supersedes Distance

In the view of the Vermont Public Service Commission, its consultants—Zinder & Associates—and the counsel for cooperatives there, the "economic distance" factor is no problem. They interpret it as meaning that "power so received is less costly than power which can be obtained from any other available source."

On this basis, Niagara power that is delivered by displacement from the St. Lawrence project would be delivered to the Vermont border for between 4.7 and 5.9 mills per kwhr, depending on the benefits realized from displacement.

"This," says the Zinder study report, "represents a saving of from 6 to 8 mills per kwhr over firm energy that has been available to Vermont, St. Lawrence power excepted. Compared to the cost of energy that would be available to VELCO (Vermont Electric Co) under its proposed contract with Niagara Mohawk Power Corp, the savings in the purchase of Niagara power would be on the order of 3 mills per kwhr at 70% load factor," the report points out.

New Transmission Required

Niagara power allocated to Vermont could be delivered from St. Lawrence over the Massena-Plattsburg-Essex transmission lines, the Zinder report says. The VELCO grid would need reinforcing, the study indicates; in particular a Middlebury-Rutland line and another circuit from Plattsburg to Essex.

In its study the Zinder firm cited a 1958 sale to Central Vermont Public Service Corp from New England Power Co nearly 172-million kwhr at a wholesale rate of 1.35¢ per unit.

The calculations on the state-line cost of Niagara power includes these items: A Niagara busbar cost of 3.88 mills per kwhr; an assumed delivery charge in New York State of 2 mills for power going to Vermont; and 1 mill or less for displacement from Massena.

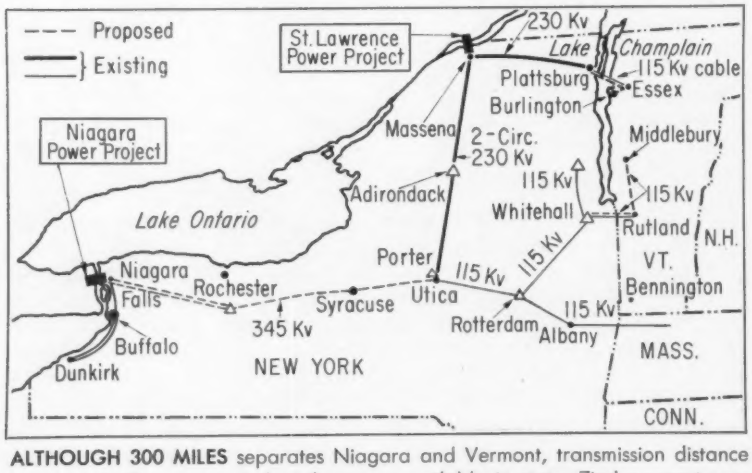
345-Kv Lines Under Way

PASNY, the Power Authority of the State of New York, builder of both the Niagara and St. Lawrence projects, plans to build two 345-kv lines to a point near Rochester. From there a single circuit 345-kv line will go to the Utica vicinity, which is the southern terminus of the present 230-kv lines from Massena. Niagara Mohawk will have two 230-kv circuits from this terminus to its Rotterdam substation. These lines will carry from Niagara about 250 Mw into Rotterdam and about 200 Mw will circulate in Canada around to Massena.

Robert Moses, PASNY chairman, has flatly stated that Vermont is not within economic transmission distance of Niagara. He adds that "the power authority has dealt generously with Vermont needs in marketing St. Lawrence power."

If Vermont is successful in its bid for Niagara power, these transmission projects probably would evolve, the report says:

- A second cable across Lake Champlain would need to be considered because of the Massena displacement. To provide back-up protection, an additional line joining the new cable to the Essex station is necessary.
- To lessen the impact of any outage on the Massena-Plattsburg circuit, a second Whitehall-Rutland circuit is warranted.
- The Vermont 115-kv grid would need reinforcement by construction of the Middlebury-Rutland line. Without it, subtransmission facilities could be overloaded during an outage of grid segments.



ALTHOUGH 300 MILES separates Niagara and Vermont, transmission distance is economic if power costs less than any available in state, Zinder report says

While PASNY Seeks an A-Plant Law

Robert Moses, power authority chairman, says governor's committees try to freeze out PASNY by indirection. A-power is not 'exclusively the domain of private utilities,' he states

The calm that followed the Niagara Power Project storm appears to have ended. Public and private organizations are at it again in New York—this time with the power authority (PASNY) pitted against two of Gov Rockefeller's committees and private utilities on the issue of atomic power.

Robert Moses, chairman of PASNY, brought things out in the open last week. In the annual report to the governor and the legislature he charged that the Committee on Power Resources and the Office of Atomic Development were attempting to "freeze out this authority by indirection."

"To put it simply," Moses stated, "we hold that the state should not at this time and at the insistence of the largest private utility companies commit itself to the proposition that the future development of atomic energy must be exclusively the domain of the private utilities."

This quotation refers to the report recently submitted to Gov Rockefeller by the two committees. The power resources group, headed by John E. Burton of Cornell University, a former PASNY chairman, skirted the private-vs-public power issue in its report (EW, Jan. 11, p 40).

"The powerful influence of the private utilities in the case of the Burton report," Moses said, "is manifested also by the injection into the report of the entirely irrelevant recommendation that the state and its municipalities pay enormous sums for moving utilities out of the way of all public highway construction regardless of benefit to the utilities themselves."

Burton Provides Rejoinder

Burton was contacted in Washington, D. C. before he had seen the annual report. News reports he had read "suggest the need for factual clarification," he said. "Two simple facts should be observed:

"1. The governor's power resources committee agreed to avoid questions of government or private ownership knowing full well that deliberation over matters of governmental philosophy would distract it from reaching a collective conclusion . . . It was not appropriate . . . to review the power authority's interest in building and operating nuclear power plants.

"2. The committee's recommendation that highway-caused utility relocation costs—'minus real benefits and salvage value of old facilities'—be shifted from utility companies and their consumers to whomever pays for highway construction arose from considerations of equity and an anticipation of great future growth of utility transmission systems and an even greater growth of our highway systems . . .

"This fact does remain—this recommendation was written and edited by two members of the power commission and no one of the three private utility members of the committee was one of those two."

The atomic office, directed by Oliver Townsend, made the point in its report that the job of developing atomic power in New York was one for private utilities. (EW, Dec. 14, 1959, p 44). The state could join the federal government and private industry as A-plant owners and operators, but "we believe . . . this would be neither practical nor wise, except in those very few instances where the public health and safety or education was importantly involved . . ." the report said. The state, instead, should fulfill the role of "a discriminating catalytic agent."

According to Moses: "The authority does not seek to be the exclusive agency in the state in the atomic field, but rather to be in a position to contribute its share." In a 1958 report prepared by Farrell, however, it was noted that PASNY had asked to be designated as New York's agency responsible for investigations and activities relating to development, building and operating of nuclear power plants.

Moses said the committee "reports propose to freeze out this authority by indirection, that is by deliberately withholding permissive legislation . . ."

In addition to Burton the resources committee members are: James C. Bonbright, professor of finance, Columbia University; Dr F. G. Crawford, PASNY trustee; Charles E. Eble, president, Consolidated Edison Co of New York; Robert E. Ginna, Rochester Gas & Electric Co chairman; Earle J. Machold, president, Niagara Mohawk Power Corp; Harry Van Arsdale Jr, president New York City Central Labor Council, AFL-CIO.

Explosion Damages Bergen Unit's Boiler

Service date of Public Service Electric & Gas Co's 290-Mw Bergen No. 2 generating unit was set back several months by a gas explosion in its boiler Feb. 8 during a test run. The extent of damage had not been determined at press time because "it was too hot to look inside," a company spokesman said. An equipment operator hospitalized for severe burns and injuries from the blast was reported "showing improvement."

The unit was under test at about 20 Mw, using natural gas as fuel, when an ignition delay took place after a load change. The delay permitted gas to accumulate in the firebox where it then ignited explosively.

Bergen No. 1, a similar unit, was carrying normal load at the time and suffered no damage. The system was undisturbed.

The damaged boiler was scheduled for commercial operation about Jan. 1, but had been delayed by a series of strikes. Public Service is unable to estimate now when it will be ready for service.

EEI Hears Reports on Wood Poles

Florida T&D meeting is told how treatment extends usefulness of standing poles. Treating cost: 25% of added value

Regular ground-line treatment economically extends the usefulness of standing poles, although each utility needs records for determining the best treating program in its area. This was the consensus of speakers from three utilities before Edison Electric Institute's Transmission & Distribution Committee at St. Petersburg, Fla.

Treating cost for an average standing pole today is about 25% of the value it contributes in longer service life, according to R. G. Steiner, Union Electric Co, in a paper co-authored by O. W. Weiss. The authors predicted annual savings of $120,000 through excavating 18 in. around 7,500 standing poles and applying preservatives every eight years.

Treatment, probably with pentachlorophenol compounds, will be applied to all standing poles, they said. Some 70% are creosoted yellow pine, the others mostly Western red cedar. Any pole over 10 years old will be sent to a treating plant for full pressure treatment.

Union Electric records indicate that poles are removed at slightly over 1% per year for causes other than decay, according to the authors' curve, removals increasing after 18 years' service. Elimination of this increase justifies the ground-line treatment program.

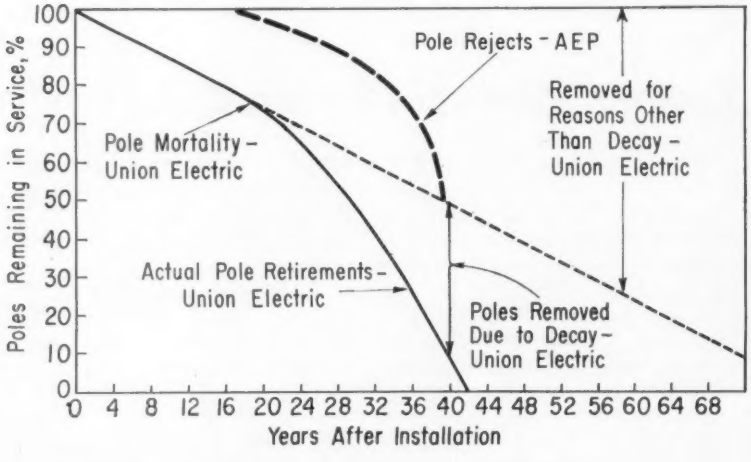
Ground-line treatment of cedar poles has proved beneficial and economical, but experiments have not yet indicated that such treatment provides the 2 to 4-in. penetration needed for creosoted yellow pine poles, said Wayne H. Johnson, American Electric Power Service Corp, who reported variations in pole mortality reflecting the effect of different climatic conditions.

Johnson suggested that treatments guided by records of inspections, be started several years before poles reach the age at which decay could be expected to start. He presented pole rejection curves indicating an average life of 26 years for those treated between 1942 and 1950 during the war-time scarcity of chemicals, and 39 years for poles treated under normal conditions. The latter shows close agreement with Union Electric's estimate of poles removed for decay.

Pennsylvania Power & Light Co has given 924,000 treatments to 220,000 poles since 1936, reported D. A. Campbell Jr. Pole life has been extended and service reliability improved at lower maintenance expenditures. Half the treatment since 1950 have been with a coal tar-and-water emulsion of sodium pentachlorophenate. The other half, and most treatments before 1950, were with a coal tar-and-creosote solution of sodium fluoride, dinitrophenol, and potassium bichromate.

The initial treating cycle was five years, but tests have justified stretching it to seven years, Campbell said. Many poles, after four treatments, are showing ground-line life equivalent to that of other parts of the pole.

Creosoted yellow pine poles need less-frequent inspection, Campbell said. Ground-line inspection, not necessary during the first 20 years, should be every nine years thereafter.



POLE MORTALITY from decay is evaluated by Union Electric on a 1,000-pole sample. American Electric Power tests of several thousand confirm the rate

Poles Shared With Phone Co

Joint use of poles with the telephone company has been facilitated by new working agreements, said A. M. Pfeifer, Detroit Edison Co. Broad authority for specifications, charges, billing, and administration has been vested in a joint committee. The new agreements provide sharing of tree-trimming and rights-of-way costs, billing by formula reflecting proportionate ownership in random sample areas, and monthly payment of intercompany balances.

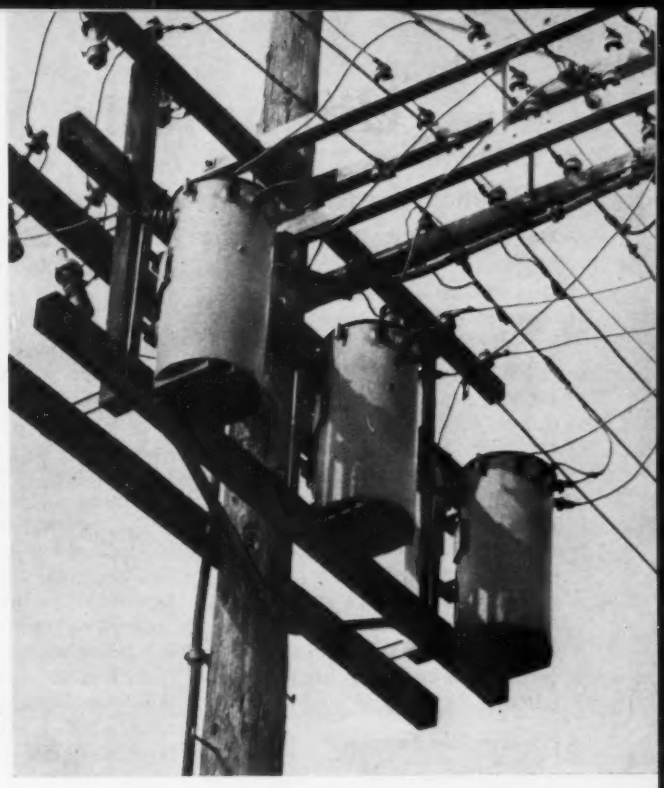
Underground residential distribution is the beginning of a radical change in methods and ideas for urban service areas, said Douglas C. White, Portland GE Co. Overhead service which will be provided for many years yet, will gradually disappear in the more congested areas. All new residential developments in the Portland area will be served underground within a few years, he predicted.

In 1959, PGE purchased and installed 100 pad-mounted transformer units with 7,686 kva capacity. The usual overhead rates and tariffs are applicable to underground. But the customer must dig and backfill the service trench to PGE specifications and pay the additional expense, which averages $147 per lot for 14 subdivisions.

(*Continued on page* 175)

Experience Proves Sealed Transformers

Random survey of units in operation for seventeen years shows successful performance



A BANK OF 1941 VINTAGE completely sealed transformers is presently operating in the Commonwealth Edison Co system on North Elston Avenue in Chicago

W. A. SUMNER, Asst. Engineering Manager, Distribution Transformer Engineering, Westinghouse Electric Corp, Pittsburgh, Pa.

Successful operation over a 17-year period of a considerable number of completely sealed distribution transformers has demonstrated the feasibility of this design. Although completely sealed units are not in widespread use, transformer design practice today attempts to approach as closely as possible the advantages of the completely sealed type.

One hundred and fifty completely sealed transformers were placed on a utility system in 1941. The units were 25-kva, 2,170-120/240-v, single-phase transformers.

The transformers were sealed by welding the cover in place. Tanks were designed so that if any of the bushings, which were of the solder-seal† type, were broken in service, the damaged porcelain could be removed by heating both the outer end of the bushing and the rim where it was soldered to the tank wall. When the old porcelain had been removed, the lead would be revealed, and the new porcelain could be slipped over it and soldered to the case.

If the transformer failed, it could be removed from the tank by burning or shearing off the edge of the cover. The tank cover and flange were sufficiently large to permit rewelding after the core and coils had been replaced. Windings were impregnated with a thermosetting varnish. Finally, each transformer was treated with a vacuum oil process to insure complete penetration of oil into all openings in the insulation, providing maximum impulse strength.

While no exact records have been kept, a recent random survey located 20 units in successful operation. One of the units was returned to the factory and a thorough examination was made. The transformer and parts were found to be in excellent condition.

It was discovered that the underside of the cover had been initially shot-blasted but not painted, but no corrosion was found. The lead taping had been done with white tape, and this material was as good as new. The coil ventilating ducts were clear, and there was no sludge in the transformer.

An analysis of the oil was made with the results shown in the table below. Utility engineers estimated that this unit had been at a location where winter peaks were 140% of the nameplate rating of the transformer.

Analysis of Oil From 17-Yr-Old Sealed Transformer

General condition	Good
Dielectric Strength	34.5 kv
Neutralization Number	0.034 mg of KOH to neutralize 1 gm of oil
Interfacial Tension	25.7 dynes/cm
Color (Union Colorimeter)	1+

†In recent years, new cements of extremely high strength and excellent weathering characteristics have been developed. These, in conjunction with modern gasketing materials and an effective bushing clamping design, make a gasketed bushing seal also suitable for long life. Some 20 units using a welded cover and gasketed bushing construction as described have now been operating for over three years on the lines of an Ohio utility, to gain experience on this type of sealed unit. Operation to date has been entirely satisfactory.

Utility Rate Structures Need Cost

Regulation needs fuel and commodity adjustment clause as hedge on leveling load factor, inflation effects, etc.

O. S. VOGEL, Director, Economic Research, Florida Power Corp., St. Petersburg, Fla.

Since World War II, many of the economic factors and operating conditions of the utility business have reversed. Spiraling costs and the slim margin on utility earnings have created many new and difficult rate problems. They have underlined the need for cost shock absorbers in the electric rate structure.

Two of these shock absorbers are fuel and commodity adjustment clauses. Both are essential parts of present-day electric utility rate regulation.

Pre-War Era Factors

The electric business in the pre-war era was characterized by:

1. Rising load factor.

2. Reasonably stable and predictable cost levels.

3. Gradual inflation, offset by increased utilization and more efficient operations.

4. Relatively good earnings, with periodic rate reductions.

In the post-war era, these conditions have changed substantially. This period has been marked by:

1. A leveling off of the load factor.

2. Unpredictable and drastic changes in cost levels.

3. A reduced margin of earnings, caused by inflation.

4. Periodic rate increases.

The pre-war rate base forms were designed to compensate for reasonably stable costs of providing electric service. These forms are wholly inadequate under today's fluctuating cost conditions.

These post-war conditions have not only placed a very heavy burden of rate cases on the commissions, but also have added a new and decisive time element. The time consumed in regulatory proceedings was not critically important in the pre-war period, but changed conditions have made time a vital element in the post-war rate case.

This post-war time element has created two new problems—regulatory lag and attrition.

Regulatory lag is responsible for the utilities' incurring a revenue loss during the period of the rate proceedings. State commissions have tried to adjust for these losses:

By using interim rates,

By adding an amount in the calculated or allowed return,

By providing an extra charge to be applied for a limited period so that investors can recover part of the loss caused by the time lag.

Attrition is caused by continually increasing investment and operating costs that are particularly effective during an inflationary period. It has been given consideration by the regulatory authorities and partially offset:

By increasing the allowed rate of return,

By giving weight to anticipated future conditions,

By using end-of-period and projected studies.

Changes Too Many

All of these plans have been realistic and helpful in stabilizing utility earnings. But there are just too many variable costs and economic changes affecting the return of a utility business to expect them to develop anything more than temporary and partial relief.

Two of the worst cost offenders in the electric utility business are fuel expense and operating and maintenance expense. Fortunately, the effects of these costs can be realistically compensated by the use of escalator billing adjustments.

The use of billing adjustments in the rate structure not only provides a sound and practical solution to the specific problem of stabilizing those fluctuations; it also improves regulation and aids both the customer and the company.

For one thing, billing adjustments reduce the regulatory commission's rate case load at a time when relief is most needed. This saves money for the customer, who otherwise would have to pay the cost of the only alternative, a series of long and costly rate proceedings.

In the past there was reluctance to use automatic adjustment clauses. This was predicated largely on the unfounded conclusion that their use would usurp regulatory authority. This myth has been dispelled by the broad and successful application of billing adjustments in recent years.

Use of an adjustment clause to compensate for fuel costs in the electric business is a widely accepted practice.

Just how drastic have been the changes in price of fuel oil per barrel shows up in the chart below.

Adjustment Is Needed

The price of fuel oil is subject not only to the effects of inflation, but also to the unpredictable level of prices in the world's oil markets. As utility fuel costs total millions of dollars per year (frequently comprising as much as 25% of the total cost of providing electric service), and since oil prices may move up or down 25% at any time, there can be no doubt of the need for automatic fuel adjustment clauses in rate schedules used by electric utilities.

It might seem desirable to incorporate generating efficiency in the development of a fuel adjustment clause. Certainly changes in plant units generally result in improved generating efficiency and a saving in fuel cost. If such a saving could be made without increasing other associated costs, it would be proper and fair to change the adjustment fuel increment to reflect each improvement in generating efficiency.

But it doesn't work out that way. Actually the cost of higher fixed charges — depreciation, taxes, and cost of money caused by the continually increasing investment costs per kw—exceed the decrease in fuel cost obtained from improved generating efficiency. Therefore, it would be most unfair to award fuel savings to the customer when they are essential and required to help offset increased fixed charges.

This is an application of Kelvin's economic law: That an economic balance exists when the annual cost of energy (or saving) equals the an-

Cushions

nual cost of the associated increased fixed charges. Actually it can be shown that the annual cost of the increased fixed charges exceeds the annual saving in fuel cost due to improved generating efficiency. The present rate of increase in overall construction cost per kw generally creates a net loss, not a saving.

The example below (marked exhibit 2) is based on four years of operations. It shows that the saving in fuel cost would offset only 70% of the increased fixed charges.

The fundamental purposes of commission regulation are, first, good service; and second, to stabilize and control earnings.

Consider the case of a company whose base rates in effect are designed to earn a fair return but whose rate structure contains no billing adjustment clauses.

The first large change in this company's operating costs — and they do occur frequently these days —will drastically affect its earned return. Such a change in operating costs would, with the present narrow margin of utility earnings, force the company into a rate case.

Delay Brings Loss

Under normal conditions a formal rate proceeding would take several months to prepare and present. During this period the company, the customers, or both would suffer a substantial loss.

The answer to the electric utilities' problem of continual and extravagant rate litigation is the use of billing adjustment clauses. This will not usurp regulation or prevent litigation, but will cushion the shock of violent cost changes on operations.

The cost of providing electric utility service can be separated into three main divisions: Fuel Costs, Other Operating and Maintenance Costs, and Fixed Charges. Each of the first two account for roughly 25% of total costs of operation; the third for the balance.

If each division could be controlled by the use of an adjustment clause, the utilities would have what might be called an ideal plan for operation and rate regulation.

Unfortunately the larger one—Fixed Charges—cannot be brought

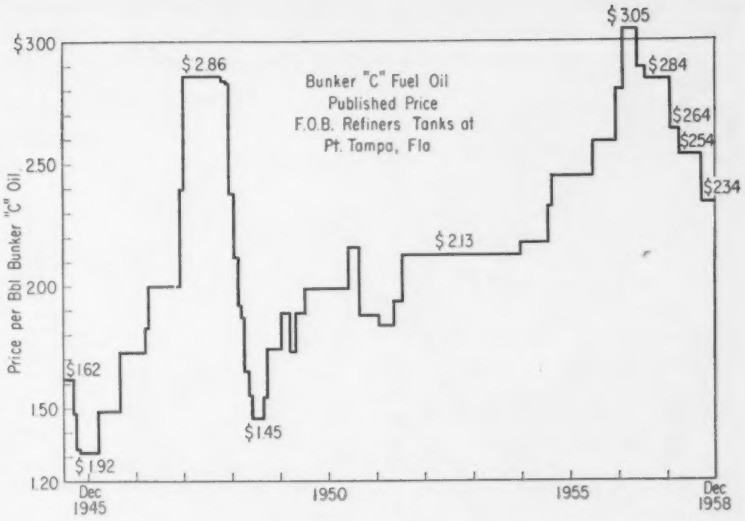


EXHIBIT 1—CHART shows how drastic the changes in price of fuel oil per barrel have been during the period 1945 to 1957 in one company's experience

EXHIBIT 2

Fuel Cost Reduction per Kwhr

Year			
1953	Kwhr Generated per Bbl	514	
1957	Kwhr Generated per Bbl	540	
	Increase Kwhr per Bbl	26	
	% Increase (1953–1957)	5.06%	
	Fuel Cost per Kwhr 1957	5.030	mills
	Est. Cost per Kwhr 1953	5.298	mills
	Savings per Kwhr Generated	.2680	mills
	Saving per Kwhr Sold .2680×1.0984	.2944	mills

Investment Cost Increase per Kwhr

Year			
1953	Overall Investment per Kw	$324.00	
1957	Overall Investment per Kw	$334.00	
	Investment Increase	$10.00	
	Kwhr per Kw 1957	3945	Kwhr
	Losses (9.84%) 1957	388	Kwhr
	Net Kwhr Sold per Kw	3557	Kwhr
	Increased Fixed Charges ($10.00×15%)	$1.50	
		.4217	mills

$$\text{Increased Fixed Charges per Kwhr} = \frac{\$1.50}{3557}$$

Ratio of Fuel Saving to Increase Fixed Charges .2944/.4217 = 70%

under any practical form of automatic control. They are too complex. The cost of money varies with market conditions, capitalization, and government policies. Depreciation is affected by salvage, which in turn varies widely with market conditions. Taxes are subject to change, and those related to revenues and earnings can vary widely during the year.

But the first two divisions—Fuel and Other Operating and Maintenance—can be realistically controlled by adjustment clauses.

The Florida Commission authorized the application of commodity and fuel adjustments in the electric rates under its jurisdiction with highly satisfactory and equitable results. Two types of commodity adjustment clause have been used in Florida, one geared to the Composite Construction Index published by the U. S. Department of Commerce; the other to the index of all commodities other than farm products and foods published by the U. S. Department of Labor.

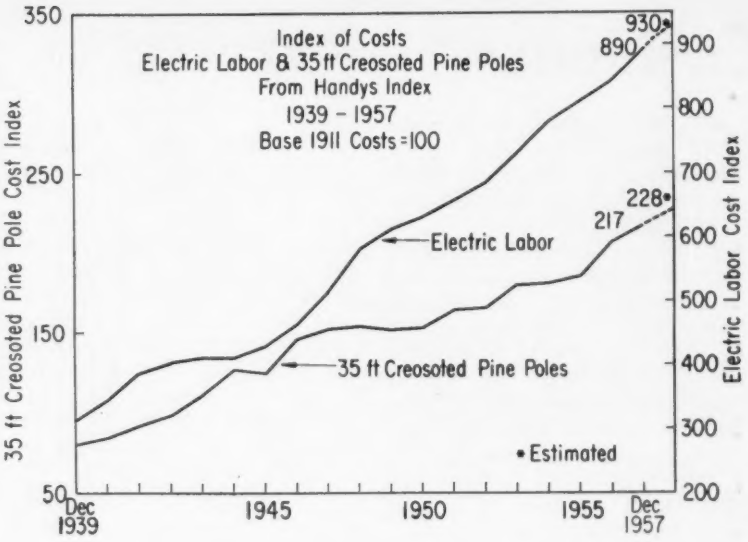


EXHIBIT 3—NEED for a commodity adjustment clause in regulated electric rates can be readily observed in the comparisons developed in the graph above

Uses Composite Index

Florida Power Corp has used the Composite Construction Index, because it is widely known and well established, is compiled by an independent governmental agency, is published monthly, and is available to the public. It combines several reliable public and private construction indexes and is geared to the same type of cost for which it is designed to compensate.

The need for a commodity adjustment clause in electric rates can be readily observed in the chart below, marked Exhibit 3.

On this chart the cost index levels have been drawn for the period 1939 through 1957, of two of the many variable cost items other than fuel making up the electric utility maintenance and operating costs. The items for which the costs have been plotted are electric labor and the cost of a 35-ft creosoted pine pole. These items were selected because cost records were readily available. The changes in price range shown for these items are typical of those involved in various costs affecting the usual operation of the electric utility business.

The slope of the graph shows how rapid the changes in cost levels have been and that the rate of change is even greater today than at any time during the entire 18 year period.

The type of commodity clause used by the company reads "For each five-point change in the level of the Composite Construction Index as established by the U. S. Department of Commerce above the index base (established by the regulatory authorities), the cost at the base rate shall be increased or decreased ½ of 1%." The 1 to 1 ratio used in the company's commodity clause is evident in the escalator increment of 10 points equals 1%.

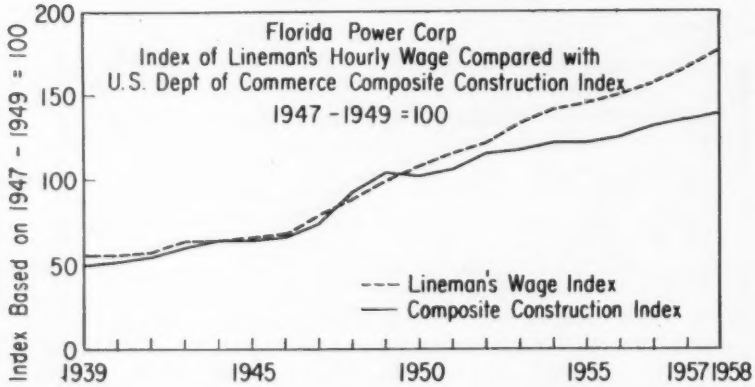


EXHIBIT 4—GRAPH compares movement of Composite Construction Index with that of Florida Power's lineman's wage per hour for the period 1939-57

Indexes Compared

Another check of the value and accuracy of the index selected and used by the company can be seen in the chart marked Exhibit 4. It compares the movement of the Composite Construction Index with the index of the company lineman's wage per hour for 1939 through 1957. This study shows that the two indexes are practically parallel over the entire period. That proves the rate of change of the costs involved are approximately the same. Therefore, the Composite Construction Index used in the company's

(*Continued on page* 89)

ANOTHER STEP AHEAD IN VOLTAGE REGULATION

APPLICATION ENGINEERING

INSTALLATION SERVICE

LINE CREW TRAINING

RAPID PARTS SHIPMENT

These General Electric Voltage Regulator

SERVICES MEAN SAVINGS

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Up to 10% lower losses, 3-db lower sound in

Core losses up to 10 percent lower than previous models and guaranteed sound levels 2 to 3 db below present industry standards are 1959 features of General Electric's entire line of medium* transformers. In addition, excitation currents of G-E medium transformers also have been reduced approximately 15 percent.

These superior characteristics of new General Electric medium transformers result from use of a new continuous annealing process for core steel. As a result, core plate insulation has been improved by 85 percent, giving better distribution of impulse voltages across the core. Edge or ripple factor has been decreased by 50 percent so that the steel has flatter characteristics, resulting in a tighter core. Watts loss-per-pound for individual laminations has been reduced eight percent.

Shown below are core laminations emerging from the annealing furnace. Here they receive individual stress-relief anneals at lower temperatures than required in batch-type annealing and without damaging effects caused by temperature gradients. Another example of General Electric's continuing transformer leadership is the emphasis placed upon research and development as depicted here by the Medium Transformer Department's anechoic sound chamber where sound level studies are conducted.

*501 to 7500 kva, 69 kv and below.

NEW LAMINATION PROCESS

G-E medium transformers

Product leadership is just part of our story. General Electric medium transformers are certified to deliver **full value** for your transformer dollar . . . in terms of superior products . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. When deciding on your next medium transformer, examine the **complete "package"** offered by General Electric. When you do, we're confident that you'll recognize General Electric superiority and how you get full value for your transformer dollar.

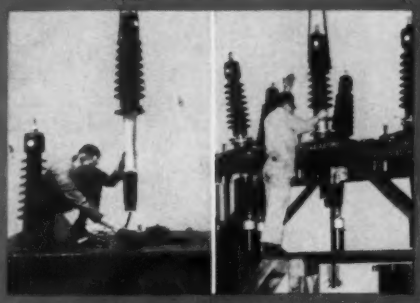
Your G-E Apparatus Sales Engineer can show you all the ways you get full value for your transformer dollar with General Electric. Ask him today for full details on the Certified Full-value Transformer Program. General Electric Company, Schenectady 5, New York. 416-27

Progress Is Our Most Important Product

GENERAL ELECTRIC

ANECHOIC SOUND CHAMBER

FULL VALUE FOR YOUR TRANSFORMER DOLLAR



SUPERIOR DESIGN, FEATURES, AND PERFORMANCE of G-E transformers is typified by new interchangeable transformer-circuit breaker bushings (above), and improved Formex† insulation (below).

FASTER SHIPMENT through rapid processing of orders . . . computer design capability . . . repetitive manufacturing facilities.

COMPLETE SERVICE . . . application and systems engineers . . . installation engineers . . . 50 conveniently located service shops.

†Reg. Trade-mark of General Electric Co.

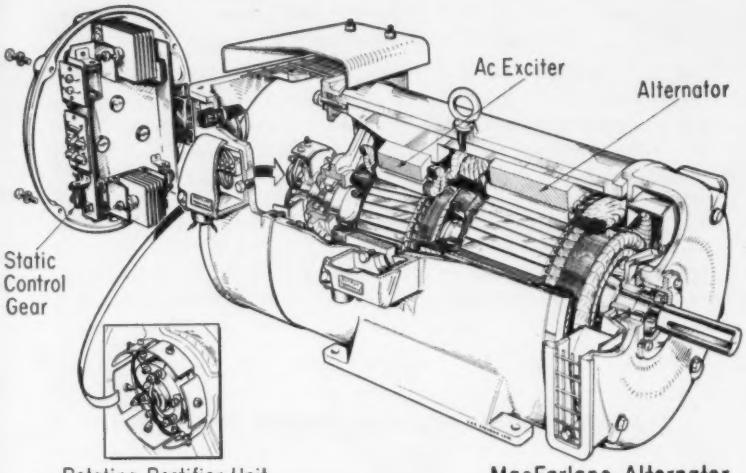
Brushless Alternator Needs Less Maintenance

A brushless alternator, self-regulating and having self-contained control gear, features temperature stability and reduced maintenance expense.

Designed by MacFarlane Engineering Co, Ltd, Glasgow, Scotland, the alternator is of the rotating field, non-salient pole type. An exciter supplies the main field, which has the exciter winding mounted on the same shaft, and the stationary exciter field is supplied from the self-regulating circuit.

The 3-phase output from the exciter armature is fed to six silicon diodes mounted on the shaft. Cables within the shaft supply the rectified dc output to the main alternator field winding. The rectifier diodes are mounted radially on cooling fins, and heat dissipation is aided by positioning the assembly near the incoming cooling-air duct.

Feed to the exciter is controlled by a feedback circuit in which a quantity proportional to the alternator voltage is derived from the output terminals via a transformer. After rectification, the feedback is matched with the constant voltage output of a reference circuit containing twin Zener diodes operating at their breakdown reverse voltage condition.

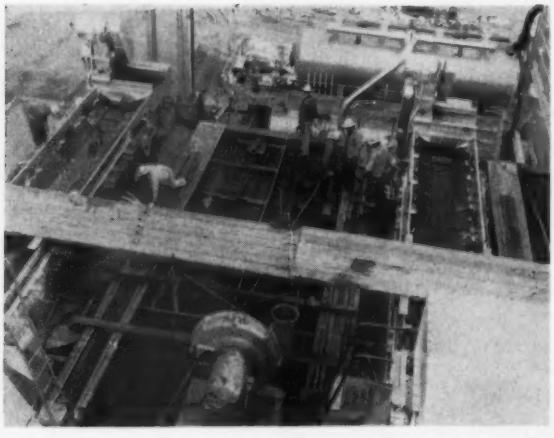


MacFarlane Alternator

A transistor amplifier accepts any error and supplies a correcting mmf to the exciter field. The amplifier is supplied from an auxiliary stator winding, wound in slots of the alternator stator on top of the armature winding to reduce surge voltage on the transistors during transient action of the alternator.

Voltage regulation of ± 1½% is claimed, and with further amplification stages the only limitation is the temperature stability of the reference diodes. This degree of regulation is obtained without any dimensional increase above conventional machines. Output voltage selection is by an external, hand-operated rheostat, the only control external to the alternator.

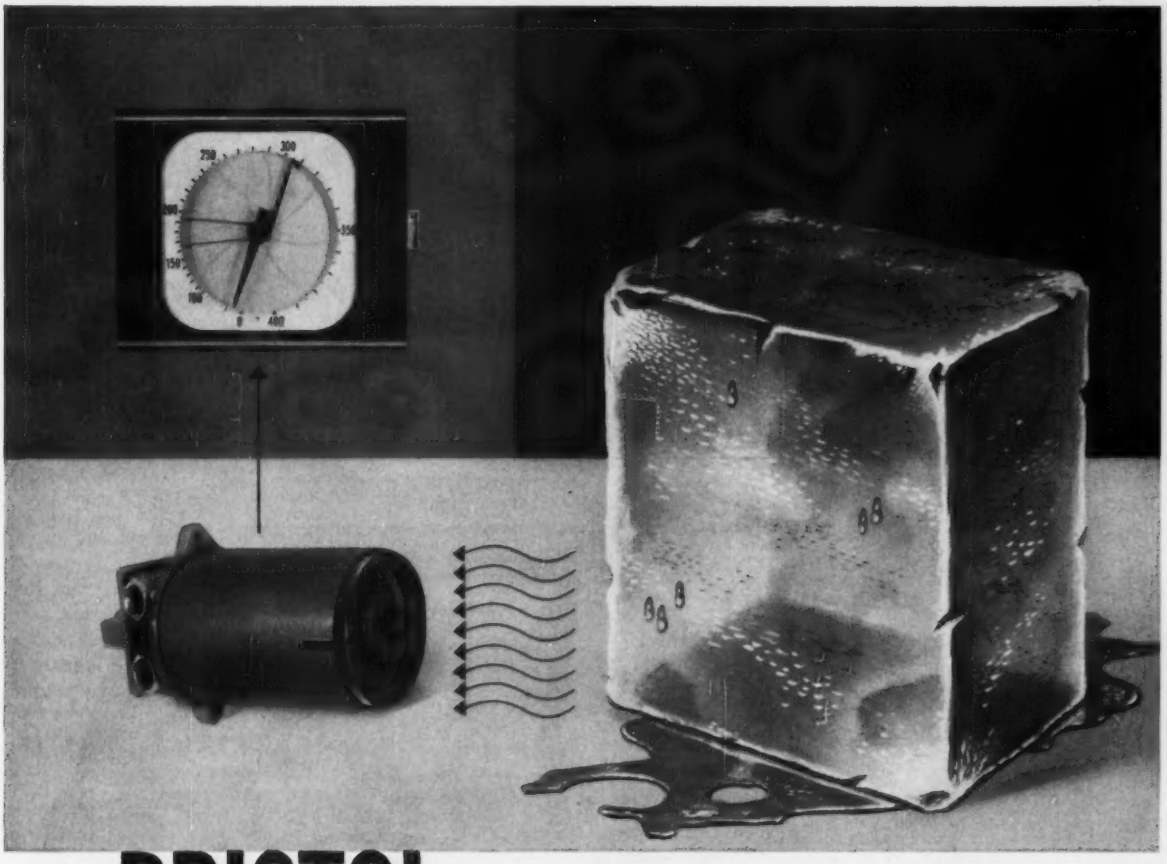
Radiant Heat Melts Snow on Tripper Deck



A hot water radient heating system embedded in the "tripper deck" of Cherokee Steam Electric Station melts away snow and ice that would normally obstruct work by Public Service Co of Colorado maintenance men during winter months. Deck heat also prevents snow and ice from building up on conveyor equipment used to distribute coal to storage bins and stokers.

Corrosion-resistant 1-in. dia wrought iron pipe, which has a coefficient of expansion similar to that of concrete, was coiled on 11-in. centers and embedded in 5¾-in. of concrete. Hot water, mixed with antifreeze and heated by a steam exchanger, is circulated through the piping system at a minimum operating temperature of 180F.

Designed by Ebasco Services, Inc, the snow melting area measures 24 ft by 50 ft. With the system in operation, "tripper deck" maintenance work is safer.



new BRISTOL low-range radiation pyrometer

IDEAL FOR NO-CONTACT, CONTINUOUS TEMPERATURE MEASUREMENTS ON

Rubber	Plastics
Synthetic rubber	Carpeting
Tile	Mineral aggregates
Roofing shingles	Chemical flows
Adhesives	Petroleum flows
Blackened or unpolished aluminum	Beverage flows
	Reactor kettles
	Mill rolls
Textiles, synthetic and natural fibres	Furnace or oven charges or exteriors
Paper	Foundry molds

...and many other substances; web processes or products; conveyed, rolled or extruded products; and stationary objects.

0-200° F and other ranges to 1100° F • Direct reading charts, scales in F or C • Calibrated interchangeable head units • Automatic built-in ambient compensation • Easy emissivity compensation

Here's the first radiation pyrometer that really gets down to 0° F.

It's the Bristol Velotron Pyrometer System—so sensitive you can sight the radiation unit (at lower left above) on your hand and get an accurate temperature indication.

And on the high end, spans and ranges are available up to 1100° F or corresponding ranges in degrees Centigrade.

Charts and scales are direct reading, in degrees F or C, even on the lowest ranges. No laborious calibration runs, calculations; no curve consulting needed! And you get famous Bristol Dynamaster* Recorder accuracy —proven in thousands of installations.

Ambient temperature compensation is automatic, completely contained in recorder unit (no third unit needed), and allows use in ambients up to 135° F.

A simple knob adjustment allows compensation for emissivity characteristics of target material from black body on down.

Interconnection cables are standard copper wire; no special, preselected lengths required.

Write for complete technical data on this outstanding new Bristol contribution to industrial pyrometry. The Bristol Company, 116 Bristol Road, Waterbury, Conn. 9.31

*T. M. Reg. U. S. Pat. Off.

BRISTOL...for improved production through measurement and control

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

INTRODUCING

SHORT NEW CHEVROLET TILT CAB TRUCKS

72" BUMPER TO BACK OF CAB

They're built like "tilts" should be built—that's the story on this new line of trucks from Chevrolet. All of the special advantages of tilt cab design—compactness, extra payload capacity, easy maintenance, maneuverability—are better than ever before. And Chevy brings you some extra-special benefits, too!

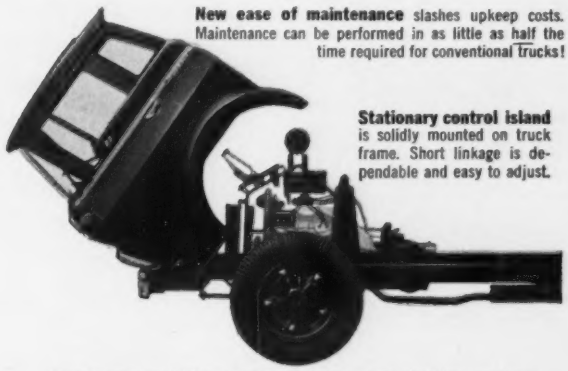
MOST COMPACT IN ITS CLASS for higher profit payloads. Six-foot-bumper-to-back-of-cab dimension gives you more cargo space than ever before (almost 60 cubic feet more than other tilt cab trucks!). You can carry bulkier payloads in a bigger body; and you can carry *heavier* payloads, too, because the extra space means more of the load weight can be carried by the front suspension. This *shorter* design means longer profits!

BEST MANEUVERABILITY. With comparable body sizes, new Chevrolet tilt cabs are as much as 2½ feet shorter overall than conventional models and save up to 48 inches in wheelbase. This *minimized* length and wheelbase pay off in *maneuverability*—easy handling in tight places that will save you time and work every day.

ROOMIEST CAB in its class! New Chevy tilt cabs are big and comfortable inside. A full 6½ feet wide, with plenty of head room and leg room for rangy drivers. And there's the safety of "picture window" visibility through a sweeping glass area.

REVOLUTIONARY TORSION-SPRING RIDE standard in all models! Independently suspended front wheels step nimbly over bumps . . . and friction-free torsion bars soak up jolts of all sizes. New variable-rate rear springs complement the new front suspension perfectly. The result is an amazingly smooth ride that assures higher safe cruising speeds, more work done every day . . . plus longer truck life with lower maintenance costs.

And in every new Chevy tilt cab model, new tougher built rear axles and brawny new box-section side-rail frames team up with the best kind of big truck power.



New ease of maintenance slashes upkeep costs. Maintenance can be performed in as little as half the time required for conventional trucks!

Stationary control island is solidly mounted on truck frame. Short linkage is dependable and easy to adjust.

Torsion-spring tilting hinge takes the work out of tilting. A tough torsion bar counterbalances the cab's weight and makes cab tilting a breeze.

Triple-safe locking system provides protection against accidental tilting. Keeps cab securely anchored down when you're under way.

20 NEW MODELS IN 5 SERIES. Five rugged medium- and heavy-duty series offer G.V.W.'s up to 25,000 lbs. Money-saving power is provided by Chevy's famous truck-built engines—economy-minded 6's for all models up to 22,000 lbs. G.V.W. and tough V8's for bigger models. Chevy makes tilt cab design *work* like never before; you can see for yourself by visiting your Chevrolet dealer right now! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

New frames for Chevrolet tilt cab trucks feature massive K-brace crossmember and rigid box-section side-rail construction. Beam strength and torsional stiffness are high for top payload capacity and stamina.

1960 CHEVROLET STURDI-BILT TRUCKS CHEVROLET

Procurement & Products

OUTLOOK ▸ **"Soaring Sixties" got off to a whirlwind start,** reported Chester F. Ogden, vice president, Detroit Edison Co, in his sum-up of business conditions before the Public Utility Buyers Group in Atlanta earlier this month. In a report based on a survey of all industry purchasing agents, Ogden said January business activity was the highest on record —receiving tremendous impetus from the buildup of steel inventories, following the long strike.

Orders have been well up, and there have been spotty price rises, said Ogden. But he noted that competition is very much in evidence and many "golden buying opportunities" have occurred over the past few months.

No one anticipates any long, drawn-out labor stoppages this year, Ogden reported, although a large number of negotiations, including many in the electrical product and equipment fields, are scheduled for this year.

Weak spots may show up in agriculture and home construction, according to the survey reported by Ogden.

BUYING POLICY ▸ **Purchasing Policy Manual has been published by Illinois Power Co** for the guidance of its purchasing department, other company departments, and the company's principal suppliers and contractors. The manual diagrams the purchasing and stores operations and sets forth the basic purchasing policies of the utility.

Among the primary objectives and responsibilities of Illinois Power's purchasing department are: "To purchase material and secure services for the company in such a manner that the maximum value is obtained for every dollar spent, so that purchases reflect a profit improvement for the company. To buy the right quality for the particular requirement, and to consider both quality and service as factors equally important as price in selecting sources of supply. To buy without prejudice; to conduct all transactions on a strictly ethical basis; to maintain sound and productive relations with all vendors; and avoid all forms of commercial bribery and legal entanglements."

Clear-cut policies set forth in the manual cover selection of sources of supply, quotation procedure, inventory levels, purchases for personnel, and maintenance of competition. The manual was prepared by the Services and Supplies Dept of Illinois Power. Purchasing and stores, as well as headquarters building management, are under the Services and Supplies Dept.

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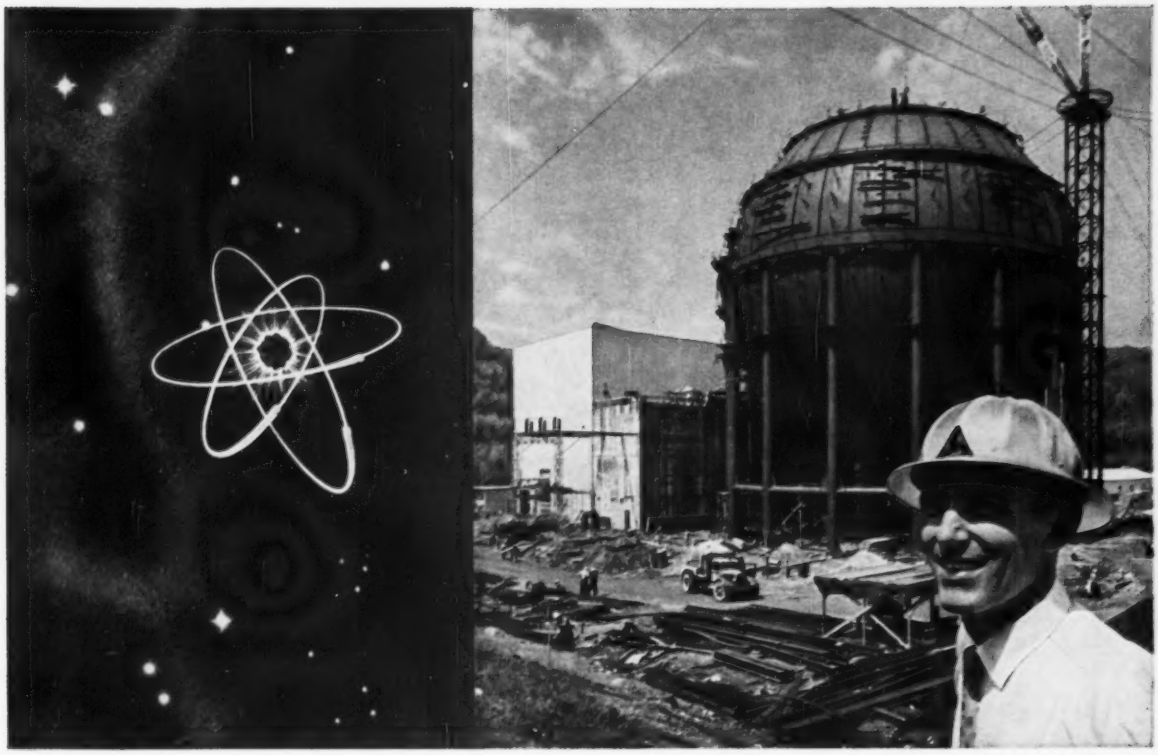
New Equipment ..... page 101
Readers Service ..... page 149



STONE & WEBSTER: ENGINEERS FOR A NEW WORLD OF POWER

Active from the start in developing nuclear power, Stone & Webster Engineering Corporation has maintained a leading position in the production of electricity from the atom. Our engineers are currently engaged in the design and construction of the 134,000 kw nuclear plant at Rowe, Mass. for Yankee Atomic Electric Company and are acting as engineers and consultants to Carolinas-Virginia Nuclear Power Associates, Inc. in the development of plans for the production of nuclear power at Parr, South Carolina.

Stone & Webster's engineering experience extends through many other areas of industrial activity. If you need engineering assistance on your next project . . . whatever its kind, location or complexity, please call or write our nearest office.

STONE & WEBSTER ENGINEERING CORPORATION
A SUBSIDIARY OF STONE & WEBSTER, INC.

New York Boston Chicago Pittsburgh Houston San Francisco Los Angeles Seattle Toronto

EEI 1959 Report Shows Few Records Broken

The year 1959 was not a record year for U. S. manufacturers of heavy electric power equipment, the Edison Electric Institute's year-end report shows. New orders were well below previous highs for all types of equipment, as were shipments (with the exception of hydraulic turbines). But a definite upswing in orders was noted in the fourth quarter of the year (again with the exception of hydro equipment). Below is a table summarizing the EEI report.

Interesting points not shown:

• **Steam turbine-generators** rated from 4,000 to 10,000 kw continued to decline in importance in 1959 with only 14 units (including five for export) shipped, totalling 101 Mw. There were 16 units ordered during 1959 (including five for export) totalling 112.5 Mw.

• **Generators for hydraulic turbines** registered a record year-end backlog with 1960 promising to be the best year yet for shipments.

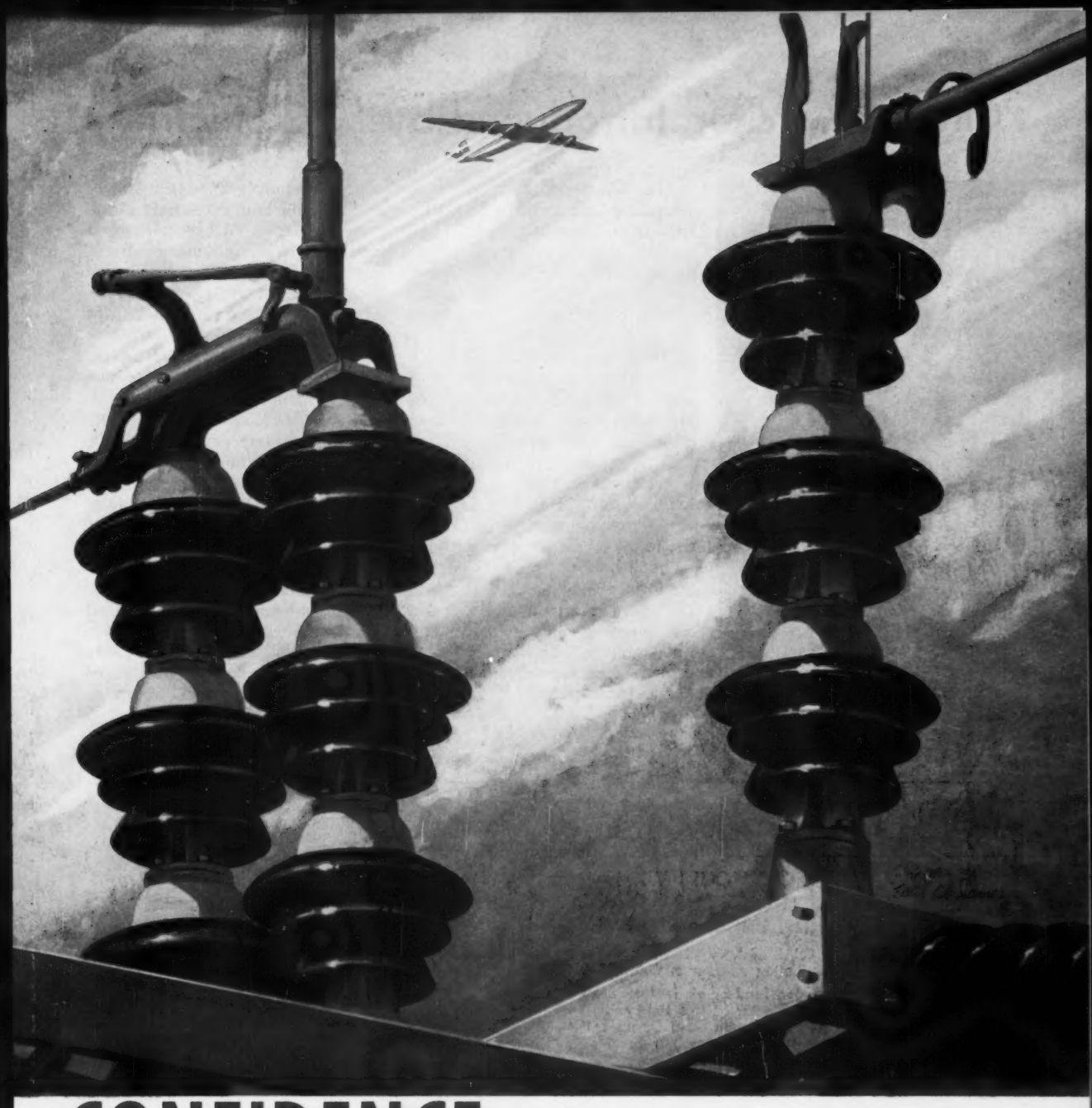
• **Hydraulic turbines** had a record year for shipments but new orders were down almost 200,000 hp from 1958.

• **Steam generator** shipments were well below the 1957 record of 133,188,000 lbs/hr. But new orders were 35,000,000 lbs/hr above 1958.

• **Power transformer** shipments were the lowest since 1952, and were significantly below the 1957 high of 72,078 Mva.

	Shipped		Scheduled for Shipment				
	1958	1959	1960	1961	1962	1963 & Later	Ordered 1959
STEAM TURBINE-GENERATORS (10,000 kw & larger) (Mw)							
U. S. Elec. Power Systems	13,965	10,396	8,755	7,630	3,443	1,202	8,799
U. S. Industrials	159	130	85	40	500	0	125
Exports	1,196	1,620	449	203	17	0	571
Total	**15,320**	**12,146**	**9,289**	**7,873**	**3,960**	**1,202**	**9,495**
GENERATORS FOR HYDRAULIC TURBINES (4,000 kw & larger) (Mw)							
U. S. Elec. Power Systems	2,227	1,619	2,650	2,020	770	358	2,120
Exports	154	112	521	0	0	0	625
Total	**2,380**	**1,730**	**3,171**	**2,020**	**770**	**358**	**2,745**
HYDRAULIC TURBINES (5,000 hp & larger) (thousand hp)							
U. S. Elec. Power Systems	3,092	3,944	2,202	1,731	684	0	1,611
Exports	293	229	0	69	0	0	69
Total	**3,385**	**4,173**	**2,202**	**1,800**	**684**	**0**	**1,680**
STEAM GENERATORS (450 psi & higher) (thousand lbs hr)							
U. S. Elec. Power Systems	97,826	67,860	60,817	35,756	6,423	0	67,250
U. S. Industrials	11,746	6,001	12,185	0	0	0	8,383
Exports	21,616	11,766	5,695	1,015	0	0	5,879
Total	**131,188**	**85,627**	**78,697**	**36,771**	**6,423**	**0**	**81,912**
POWER TRANSFORMERS (501 kva & larger) (Mva)							
U. S. El. Pr. Sys. & U. S. Indl.	45,731	41,558	28,791	8,419	2,197	690	42,465
Exports	1,468	1,472	1,381	0	0	0	1,522
Total	**47,199**	**43,030**	**30,172**	**8,419**	**2,197**	**690**	**43,987**

(More News of Manufacturers on page 86)



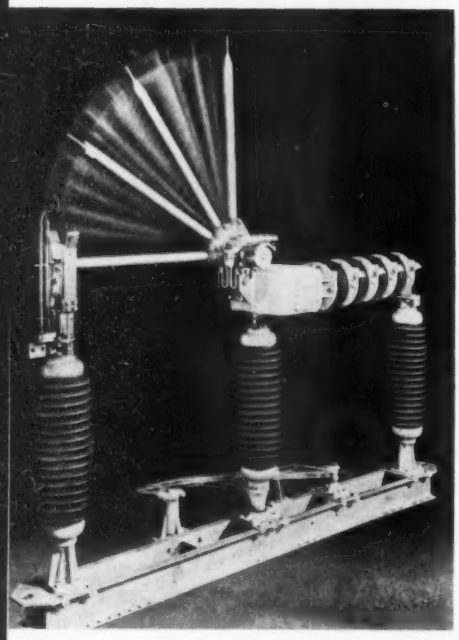
CONFIDENCE

Victor No. 729 Apparatus Insulators stand like sentinels atop this sub-station, guarding high voltage conductors and costly switching equipment.

It's your responsibility to supply power to all sorts of customers ranging from small householders to big industrials. Nothing puts the response into responsibility like insulators that won't let you down, assuring continuity of service. Power men who take their responsibility seriously depend on VICTOR Apparatus Insulators—the only insulators in the world made of **Purified Porcelain,** finest porcelain ever developed. To retain your continued confidence, we make insulators that won't cross you up—or us, either. Victor quality is not just skin-deep—it goes all the way through the complete assembled apparatus insulator. For catalog, specifications and prices contact your nearby VICTOR Sales Office. Victor Insulators Division, I-T-E Circuit Breaker Company, Victor, N. Y.

I-T-E CIRCUIT BREAKER COMPANY

'Circuit-Switcher' Introduced by S&C Electric



The "Circuit-Switcher," a new development announced by S&C Electric, is so named because it resembles a load interrupter switch but operates more like a high-voltage circuit breaker. The generic title covers a family of switchgear for handling a number of circuit interrupting duties, 34.5-138 kv.

The device is designed, at present, for all forms of load switching. S&C expects later models to include fault interruption capabilities.

Labeling the Circuit-Switcher "a new concept in high-voltage circuit interruption," S&C's President John R. Conrad summarizes its similarities to a load interrupter switch and a circuit breaker. Besides being like the former in appearance, it mounts like a load interrupter, is opened and closed in similar fashion, and it isolates circuits visibly with air as does the load interrupter. However, like a circuit breaker, it carries current continuously through its interrupting unit and withstands short-time surges; its vital close-and-trip mechanisms are fully enclosed and protected. Like a breaker, it trips from stored energy; however, the energy is stored within it. Similar to a circuit breaker with its trip-free feature and latch-check switch, Circuit-Switcher has built-in positive sequence control.

By segmenting switching duty according to severity of high-voltage switching duty requirements, and by putting the Circuit-Switcher interrupting section into modular form, S&C introduces the idea of tailoring circuit-interrupting devices. The devices thus fit specific applications within a given voltage class. A Circuit-Switcher can be selected which has just the number of interrupting units actually required. By building up the proper number of modular units in series, ability to

GENERAL ELECTRIC CUTOUTS WITH EXCLUSIVE GAS PRINCIPLE PERMIT QUICK, SAFE AND ECONOMICAL LOAD BREAK

by CHARLES J. GRAHAM, Supervisor, Distribution Arrester & Cutout Sales

The gas load-break feature available since 1957 on G-E 100A enclosed cutouts, has now been incorporated into all G-E open type cutouts. This means your linemen, using conventional switchsticks, can interrupt load currents safely and quickly even at full rating with G-E cutouts. As the cutout is opened the load current arc is extinguished within a few cycles by gas from a replaceable monel cylinder.

This revolutionary load-break principle is ***safe, simple*** and ***economical.*** It overcomes the corrosion, force and link-stretching problems involved in the mechanical link-break principle. And ***the lineman has complete control***—his switchstick is in the same ring that operates the fuse holder.

More important there are no complicated, expensive switchsticks required. Even the insulator frame is the same. Simply change fuse holders to get load break, or use disconnecting blade with cylinder to get 200 amp load break.

Utilities are finding more and more applications for load-break cutouts—at sectionalizing points, large transformer banks and capacitor installations. For low-cost switching applications, gas load break is the best solution.

For more details about our full line of proven cutouts with gas load break, contact your G-E representative, or write Sect. 435-19, General Electric Co., Schenectady, N. Y.

GENERAL ELECTRIC

NEW from General Electric . . .

withstand recovery voltage can be matched to system recovery voltage characteristics.

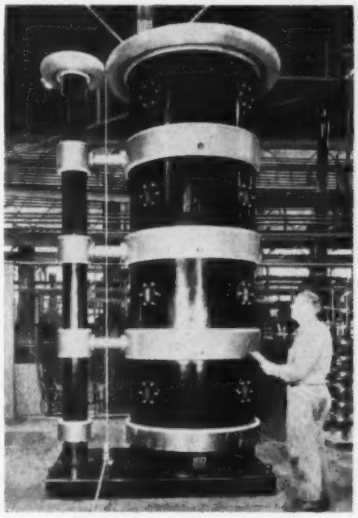
Eight major application classifications have been established: for transformer switching, load dropping, load splitting, line dropping, cable switching, and capacitor bank switching. These major classifications are further subdivided by type of circuit connection and system grounding.

A "brain" mechanism is combined with the interrupting unit in the heart of the Circuit-Switcher, to give built-in operating sequence control. In this way the unit differs from a load interrupter switch in which the disconnect is dominant and the interrupting unit an accessory.

Two movable contact rods working in parallel are used to combine both continuous-current-carrying capability and high-speed circuit interruption in the interrupting unit. One rod is massive to carry load; the other is light for high-speed travel.

EHV Cable Tester Installed

This 500-kv, 25-ma dc cable test set (below) will be the latest addition to Simplex Wire & Cable's new research facility at Cambridge, Mass. The G.E. unit will increase test set rating to one million volts.



A-C Receives U. S. and Overseas Hydro Contracts

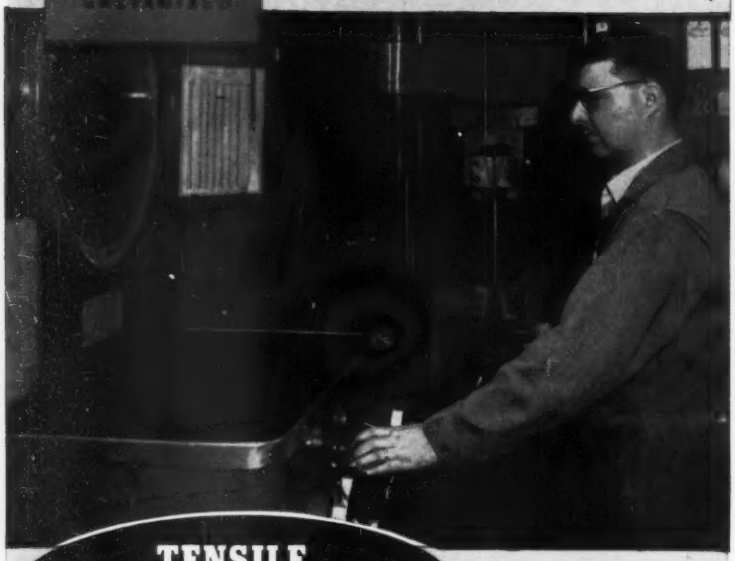
Allis-Chalmers Mfg Co is building three ac Kaplan turbines with the highest heads of any turned out at its York works. They will be installed at Duke Power Co's Cowan's Ford project, near Mt. Holly, N.C. An A-C spokesman states it is also believed to be the highest head Kaplan installation in the U.S.

The 265-in. units are each guaranteed to develop 121,000 hp under a 92-ft head and 160,000 hp under the maximum head of 115 ft. The plant is designed to operate almost exclusively to carry the high peaks of Duke Power's load and will generate power only 4½% of the year.

Other contracts received by Allis-Chalmers recently cover pump-turbines for installation at the Provvidenza generating plant near Rome, Italy, and the Hatanagi plant, Naygoya, Japan. The unit for the former is a reversible Francis type, 70,000 hp at 850-ft net head, 375 rpm, slated to pump 600 cfs at 860-

. . . gas load break on complete line of distribution cutouts

Crapo STEEL STRAND



TENSILE STRENGTH TESTS*

Laboratory Tests
Assure HIGH DEPENDABLE QUALITY

When you specify a size and grade of CRAPO Galvanized Steel Strand you can be sure that it will meet or exceed the required standards. The wire used in its manufacture is laboratory tested in process, and before stranding, for tensile strength, ductility, elongation, gauge, and the quality and weight of the zinc coating. The finished strand is rechecked by the laboratory for tensile strength, lay, wire diameter, ductility and galvanizing.

This continuous testing is but one of the reasons why CRAPO galvanized steel strand enjoys a reputation second to none for long life and dependable performance. More than 50 years of specialized skill and experience in producing quality strand for the power and communication industries are your further assurance of its all 'round reliability.

Send for this New
FREE Booklet
"The Story Behind CRAPO Galvanized Wire and Strand" illustrating and describing manufacturing and testing techniques. Ask for Booklet B-59!

AVAILABLE IN 3 COATINGS
For Guys, Messenger and Overhead Ground Wire
All sizes and grades of CRAPO Galvanized Steel Strand are available in A, B and C coatings. Class B coating is twice as thick as Class A coating; Class C is three times as thick as Class A.

*Determines ductility of wire and adherent quality of galvanizing.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

ft dynamic head. Maximum head for generating will be 900 ft, for pumping 940 ft. The Japanese unit, also a Francis type, will be 69,000 hp at 334-ft net head, 200 rpm for generation, 1600 cf at 250-ft dynamic head. Maximum pumping head will be 338.5 ft.

MANUFACTURERS BRIEFS

H. K. Porter Co, Inc, has purchased 90% of the stock of The Patterson-Sargent Co, of Cleveland, manufacturers of paints for homes and industries. It will be operated as a subsidiary. P-S reports $10-million sales in '59 . . . **Hatfield Wire & Cable Div** of Continental Copper & Steel Industries, Inc, is building a 240,000-sq-ft plant in Linden, N. J., which will produce all types of natural and synthetic rubber insulated wire and cable for the electrical industry, exclusively. New product lines will include higher voltage cables for utilities and larger multi-conductor cables, with production to begin early this spring. Hatfield's Hillside plant then will concentrate exclusively on making plastic insulated types of wire and cable products and will develop new plastic insulated lines . . . **The International Harvester Co** will construct a new motor truck parts depot on a 30-acre site south of the company's Fort Wayne motor truck engineering department and laboratories. It will be IH's largest parts distribution facility, with a 625,000-sq-ft building, covering 15 acres. Motor truck parts from five plants and a subsidiary will be packaged and warehoused there, and 12 motor parts depots will be supplied by the facility . . . **Union Carbide Corp** and **C-E-I-R, Inc,** a research and computer services firm headquartered in Washington, D. C., have signed a two-year agreement to divide equally the use of a high-speed IBM 7090 computer system. The transistorized data processing system, capable of 200,000 calculations per second, will be installed next summer in the new Union Carbide building being completed in N.Y.C. C-E-I-R will make its share of computer time available to business, industrial and government

clients on an hourly or job basis and will provide a complete staff of technicians on computer applications, housed on 1½ floors in the UC building . . . **Daniels Standards, Inc,** has been formed by Gordon E. Daniels and a group of associates to manufacture steel, aluminum, and galvanized street lighting standards, traffic signal supports, and other equipment for public, plant, and safety lighting. Both round and octagonal shafts are being made in a plant in Humboldt, Tenn., which was completed in December. Executive offices are located in Nashville . . . **Federal Pacific Electric** has opened a 35,000-sq-ft automated processing plant in Newark, N.J., which will manufacture plastic components for the company's products. Plant capacity is 500,000 lb of molding compound per month . . . **Hamilton-Thomas Corp,** of Ohio, has acquired major interests in Griscom-Russell Co, of Ohio, condenser and heat exchanger manufacturer, and Smart-Turner Machine Co, Ltd, of Ontario, Can., pump manufacturer. H-T also owns C. H. Wheeler Mfg, manufacturer of condensers and heat exchangers.

Need Cost Cushions

(*Continued from page* 74)

commodity clause is a dependable and reliable base for the control of the company's changing operating costs.

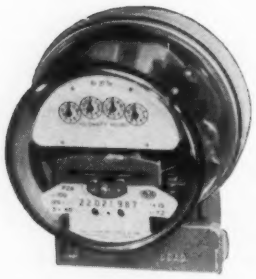
Actual experience proves that application of a commodity clause in the rate structure offsets most of the changing costs of providing service, other than the costs of fuel and fixed charges, promptly and equitably and without gain or loss to either party. In this way the purposes of regulation have been realistically and effectively carried out.

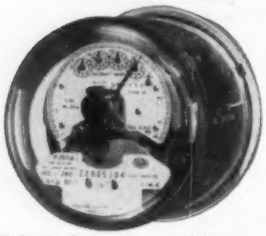
Past operating and regulatory experience has demonstrated a practical need for commodity as well as fuel adjustment clauses. Their use in utility rate patterns today, because of the critical time element, is practical and urgent.

These studies show that the use of billing adjustments not only preserve and augment the purposes of regulation, but greatly increase the adaptability of the commission's regulatory powers and procedures.

DEVELOPED TO MEET YOUR NEEDS...

ACCELERATED





SANGAMO P2 (two element) Meters accurately measure loads from 18 to 96,000 watts. They give sustained accuracy because of Sangamo's precise factory calibration... skillful design... careful selection of materials... rigid manufacturing control. Slow disk speed, reduced current and potential damping provide greater inherent accuracy in P2 meters.

Now, through new techniques, Sangamo polyphase meters are shipped only five days after your order is received at our Springfield plant. This fast, pacesetter service is made possible through a new order entry system, a new manufacturing scheduling system—using our IBM computer—and new shipping techniques and facilities.

Meters flow from assembly and test lines *to you* without delay. The new million dollar factory warehousing-shipping operation backs up local meter stocks.

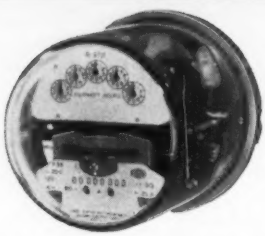
Consider this: Five day service on P2 and P3 meters (with demand registers too!) means that you can reduce inventories, and still have the meters *when you need them*. It means you can utilize your crews more effectively, reduce handling, and save storage space. In short, you can cut costs all along the line.

Want to be convinced that our delivery is really fast? Just keep tabs on your next order of Sangamo polyphase meters—the quick delivery time is your proof.

Want to be convinced of the excellence of P2 and P3 meters? Order some and test them. We are sure you will be pleased.

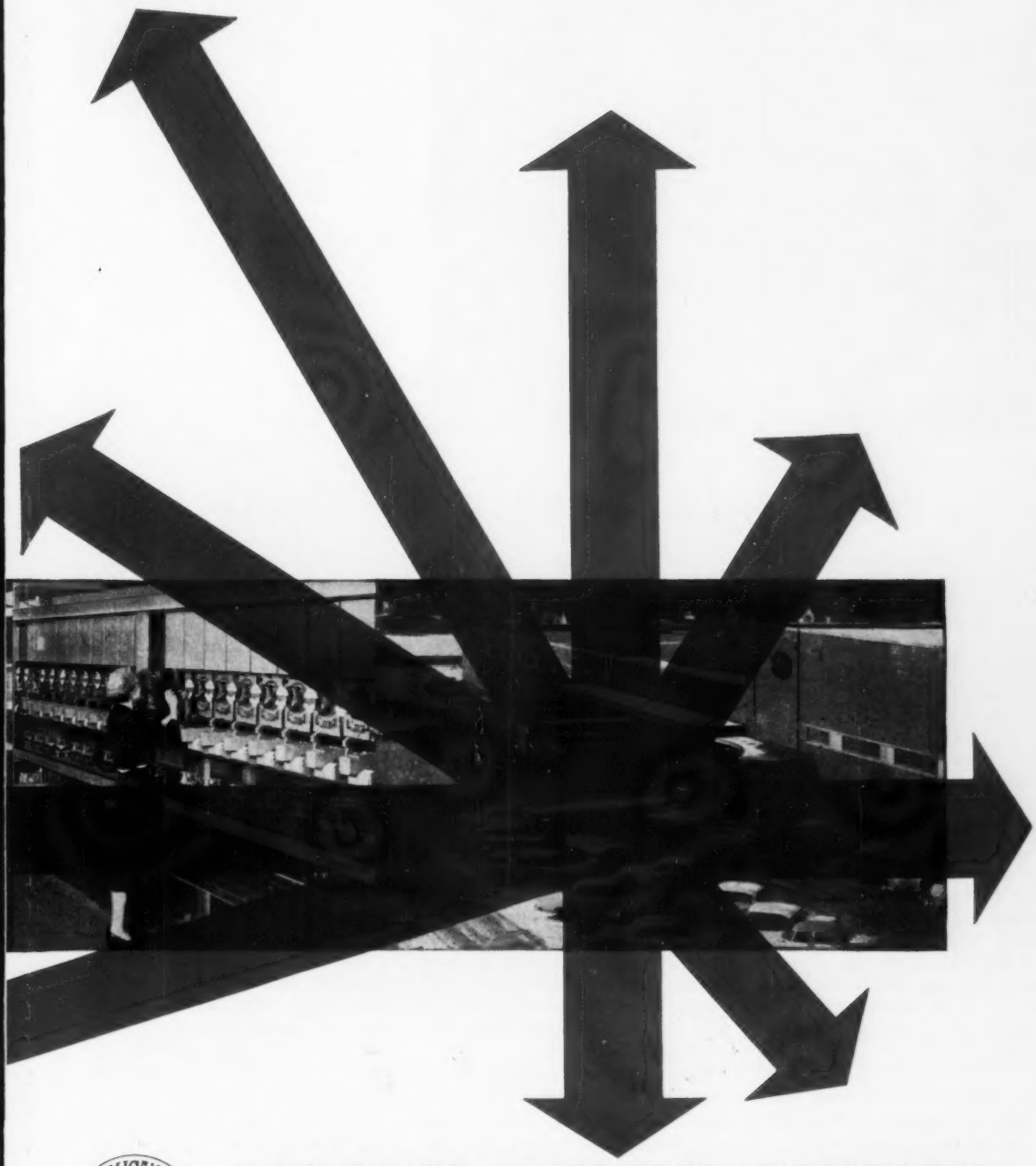
RAPID DELIVERYMAN... SANGAMO STYLE

A computer in the role of deliveryman? Sure... for at Sangamo, our IBM computer plays a key role in getting P2 and P3 meters to you faster. We use it to process orders, to program production, and to determine the number of components necessary to produce the meters you need when you want them. It performs these duties in minutes, not days... lets us telescope the time it takes to process your order, assemble, and ship your meters.



SANGAMO P3 (three element) Meters give you full revenue from large loads. Full 200 ampere capacity. Modern, small size, single disk round design cuts weight by 50%—volume by 50%—over that of bathtub-type three-stator meters. Replacement covers for P3 meters save you money, too.

DELIVERY ON POLYPHASE METERS



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM60-8

ELECTRIC YARD LIGHTS were installed on practically every front lawn of this Cedar Rapids, Iowa, community. Door-to-door salesmanship was responsible for this panorama of light. At Christmas, colored bulbs were substituted for white

Utility Promotion Adds 550 Yard Lights

A door-to-door campaign in new residential areas by Iowa Electric Light & Power Co has sold 550 automatic electric yard lights, and added to the beauty and safety of a Cedar Rapids residential area.

In some areas the yard lights have taken the place of street lights, constituting a savings to the city and the power company.

The idea of installing yard lights occurred when it was learned that the Cedar Hills area in northwest Cedar Rapids was being expanded by the Midwest Investment Co, a local real estate firm.

Power lines had been installed across the back of the lots. But the builders felt that additional poles, which would be necessary to serve the expansion, would detract from the beauty of the area. They called Iowa EL&P and asked if it could furnish lighting not involving poles and wires. The utility decided electric yard lights were the answer.

A house-to-house canvass was then made in areas where homes had already been completed. Two hundred yard lights were sold, often to every house in a block.

A contract was then made with the developer to include the cost of an installed automatic yard light in the purchase price of each home sold in new additions to the division.

The Cedar Rapids' Department of Public Safety was also consulted and it approved the plan. The reasoning was that with these yard lights, burglaries would be cut since properties would be well lighted outside, and traffic accidents could be held to a minimum as whole blocks of streets would be lighted properly.

Solve Street Lighting Problem

Next target was an area just outside the city limits. There were no street lights, since the city of Cedar Rapids had no jurisdiction in that area, so it was felt yard lights would offer the ideal solution to the outdoor lighting problem.

Crews contacted residents in this area and sold another 100 yard lights.

In addition, 250 have been installed in individual locations throughout Cedar Rapids.

Because of the success of this campaign for the Cedar Rapids Division, other divisions in the utility are taking up the plan.

The special price offered to customers is $51.60, with no additional interest or carrying charges. The price covers the fixture and installation, and the homeowner may add it to his electric bill and pay over a period of 24 months if desired.

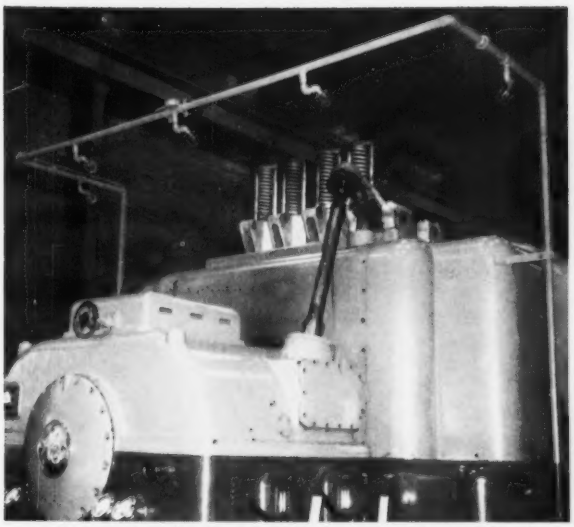
All yard lights have photo-electric cells which turn the lights on at twilight and off at dawn. Convenience outlets in light posts have varied uses where outdoor power is needed.

An added touch during the Christmas holidays was substituting colored bulbs for white, alternating different colors throughout each block.

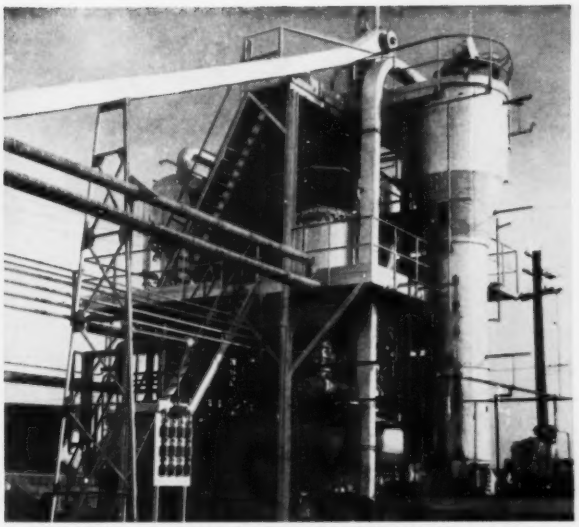
The convenience outlets gave opportunity for additional lighting decorations. The holiday lighting was so extensive in the Cedar Hills area that a Christmas lighting contest was sponsored cooperatively by IEL&P and the developer.

Additional load from the 550 yard lights is approximately 33 kw. Added yearly revenue will be $2,640, but the future Christmas lighting load is expected to add considerably to those figures.

(*More Selling on page* 96)



At Pennsylvania Power and Light Company, Sunbury, Pa., this steam generator is protected by an automatic Grinnell Protecto-Spray system in the event of outside fires and by a Dry Chemical system inside the casing.



At Canadian Vegetable Oil Processing Ltd., Hamilton, Ontario, Grinnell ProtectoSpray safeguards upper structure of this hexane solvent extraction unit, while a ProtectoFoam system guards the lower section.

At the RCAF supply depot at Namao, Alberta, this infrared drying oven is protected by a Dry Chemical system engineered by Grinnell to protect against possible fire resulting from ignition of flammable vapor mixtures.

At Dresser Industries, Inc., Dallas, Texas, hot metal temporarily ignites resulting vapors as metal is being submerged. If fire should get out of control, a Grinnell-installed Carbon Dioxide system is on guard to extinguish it quickly.

You can rely on Grinnell for the right protection against destruction by fire!

Grinnell has had 90 years experience in devising fire protection systems for all kinds of fire hazards — systems which can be relied on to protect the continuity of your business and to safeguard your dollar investment. Grinnell offers you quality-controlled manufacturing, layouts by experienced engineers, and installations by skilled crews. Let Grinnell engineers help you select the right system.

16 mm. Sound-Color Film—Get up to date on fire with Grinnell's 35-minute film — "Fire Protection Through Research." Both typical and unusual fire hazards are described and demonstrated. To borrow this film, without charge, write — Grinnell Company, Providence 1, Rhode Island.

GRINNELL

FIRE PROTECTION SYSTEMS SINCE 1870

YOU'RE ON

Patented — U.S. Patent Number 2,761,273

TRADEMARK — "GUY-GRIP"

EASIER TENSIONING

with a compact, more durable loop... just like the strand.

SAME PERFORMANCE

as the Open Helix Loop GUY-GRIP dead-ends. Hold 100% of the rated breaking strength of the strand.

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16-page pocket-sized Application Procedures booklet for your linemen

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with *Preformed*™

New Cabled Loop GUY-GRIP dead-ends

SIZES:

5/16"
3/8"
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SMOOTHER CONTOURING

—more adaptable for multiple guying.

YOU CAN USE THE MODERN TWIST IN GUYING
with all materials and standard fittings.

PREFORMED LINE PRODUCTS COMPANY
DEPT. GG-4
5349 St. Clair Avenue · Cleveland 3, Ohio

EEI Tightens Up Sales Confab; To Last 2½ Days

The 26th annual Sales Conference of Edison Electric Institute will be held April 4-6 at Chicago's Edgewater Beach Hotel. The conference has been streamlined this year and will have the general sessions on Tuesday and Wednesday mornings, April 5 and 6.

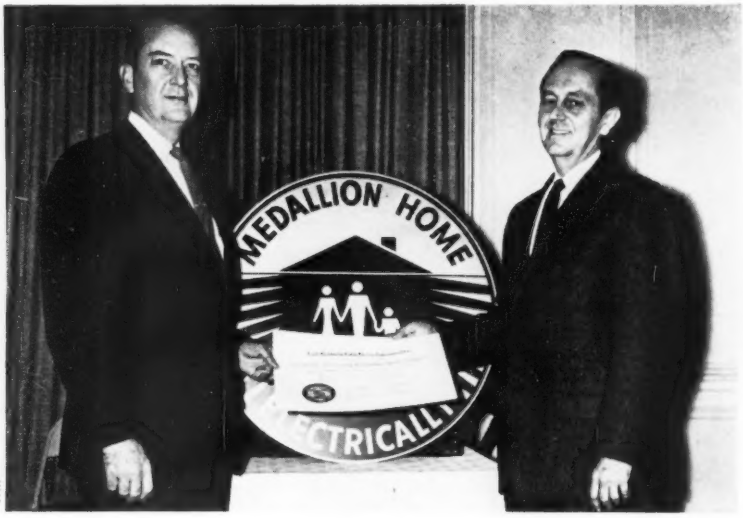
Principal speakers at the sessions will include Allen S. King, EEI president and president, Northern States Power Co, speaking on the "State of Industry." G. S. Rawls, president, Louisiana Power & Light Co will discuss, "Relationship of Sales to Other Departments;" "Live Better Electrically Program" will be examined by Ralph Zeuther, LBE program manager; and Dr. Virginia Miles will comment on "Advertising and Motivation Research." These will all be on Tuesday.

Wednesday's general sessions will stress the "all-electric concept." C. M. Wallace Jr, vice president, Georgia Power Co will deliver the opening remarks. The role of the architect in all-electric living will be discussed by Richard W. Quinn, a senior at Notre Dame. Arthur S. Goldman, director of marketing, House & Home magazine will talk about the builders viewpoint, and Fred J. Borch, GE vice president, from the manufacturer's.

Other features of the 1960 conference will be an EEI Sales Promotion Awards luncheon on Tuesday, a general luncheon on Wednesday, and committee group meetings Tuesday afternoon.

Cable Hatch Developed

"Cable hatch" for mobile home power supply lines has been introduced by Hub Industries, Inc, Chicago. Unit features a sponge rubber gasket which makes it watertight.



Co-ops Get Large MH Franchise

Twenty Kentucky rural electric cooperatives, representing 200,000 consumers, have received franchises to issue Gold Medallions on a unified standard. In the photo above, Laurance Messick (right), director of the Medallion Home Program, presents the franchise certificate to J. B. Galloway, manager of Farmers Rural Electric Cooperative, who represented the group.

At a luncheon honoring the group, Messick pointed out that the award represented the largest single franchise on a unified basis in the history of the MH Program. It is also the first award made since the program came under the direction of NEMA.

Appliance Sales May Reach 200 Million in 60's

The next decade will offer opportunities for the sale of 190 to 200 million major electrical appliances. But the appliance industry will have to compete realistically with an increasing variety of discretionary purchases.

These are the opinions of B. A. Chapman, executive vice president and general manager, Appliance Division, American Motors Corp. He included refrigerators, clothes washers, electric ranges, freezers, clothes dryers, room air conditioners, dishwashers, and disposers.

Chapman noted, however, that an "attainable" portion of the potential lies in the 180-million unit area, 36% greater than factory sales of the 1950's. The past decade showed a 103% increase over the 1940's.

Chapman, who foresees "comic book and science fiction" conceptions of kitchens and home laundries in the future, also said that basic usefulness, dependability, and ease and economy of operation are the ingredients most important to the customer in selecting an appliance.

He also emphasized the potential of the replacement market. Of the some 150 million appliances, in the eight-product group, now in use, there is a potential of 116 million replacements in the next decade.

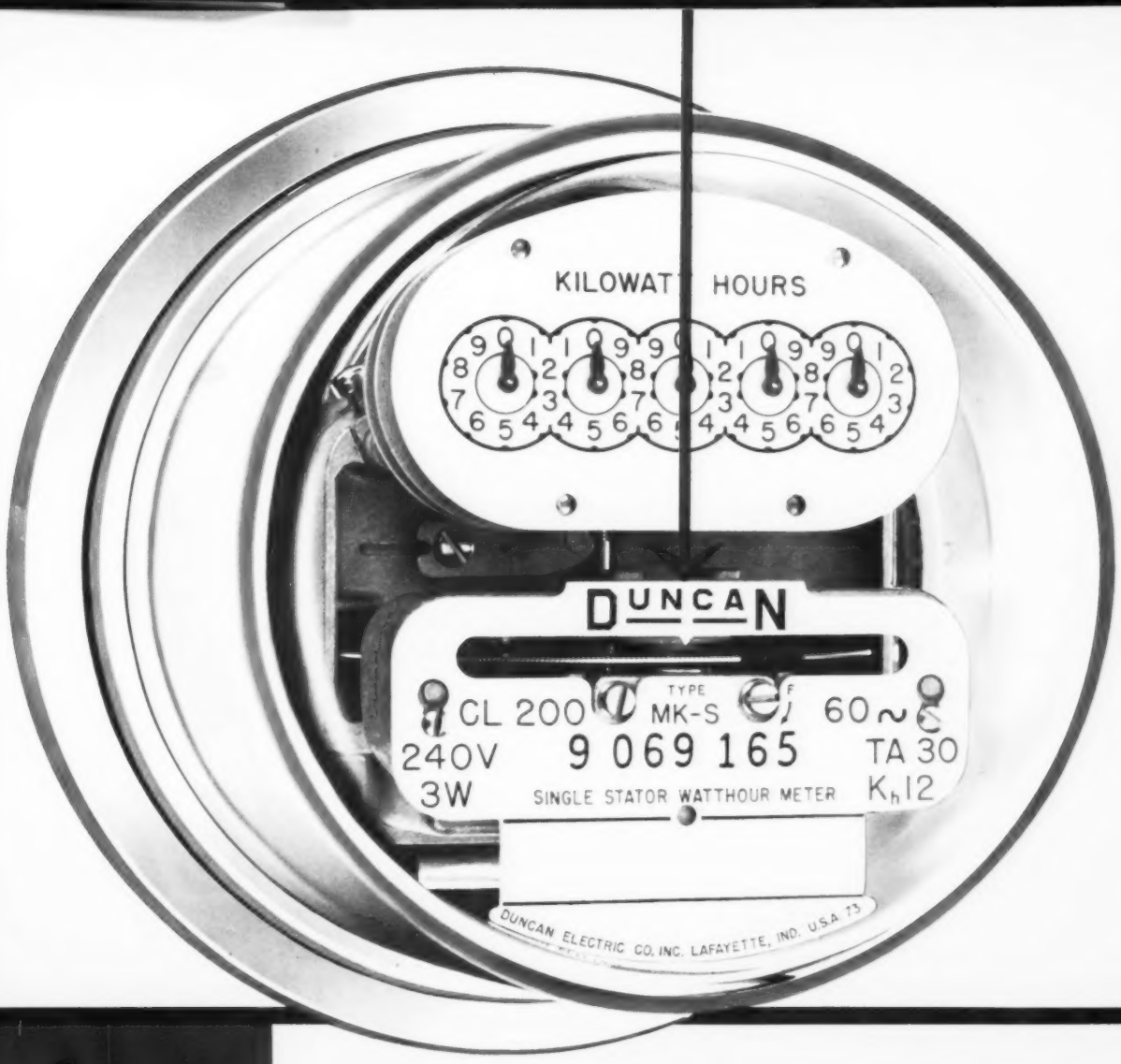
Increased saturation is another important potential, Chapman said. Though refrigerators have a 99% saturation, and electric washers a 91% saturation, the other six products are rapidly becoming necessities too.

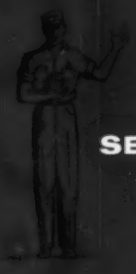
He listed their present saturations: Freezers, 23%; electric and gas clothes dryers, 18%; room air conditioners, 15%; food waste disposers, 10%; dishwashers, 6.5%.

Principal improvements in appliances in the next 10 years, according to Chapman, will inclue:

- Refrigerators with improved insulation, plus further steps in shelf arrangement and better design.
- Electric ranges with improved surface units free of crevices and with improved devices for cleaning.
- More built-in units

But don't expect thermoelectric refrigeration and electronic cooking as average household fixtures, Chapman added.

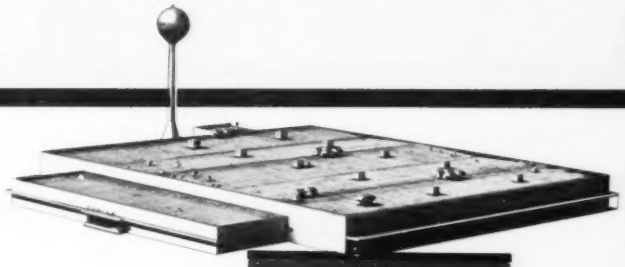

KILOWATT HOURS
DUNCAN
TYPE
CL 200 MK-S 60~
240V 9 069 165 TA 30
3W SINGLE STATOR WATTHOUR METER Kh 12
DUNCAN ELECTRIC CO. INC. LAFAYETTE, IND. U.S.A.



No. 1 SELLING POINT

More Capacity per Dollar

CLASS 200 RATINGS *FOR MORE HOUSEPOWER!*



"Thinking Ahead . . . Moving Ahead . . . to stay Ahead of Demand"

DUNCAN Concentrates on Metering Equipment — the attention of the entire Duncan Organization is devoted to your metering requirements.

DUNCAN

WATTHOUR METERS • MOUNTING DEVICES • DEMAND METERS

TODAY YOUR DOLLAR BUYS

MORE METERING CAPACITY

Classes represent maximum current for each rating — 10 amperes for Instrument Transformers, 100 and 200 amperes self-contained for corresponding services. For today's growing loads, Class 200 should be considered for general purpose self-contained installations.

Type MK represents the latest carefully engineered product in a long line of DUNCAN developments . . . built to accurately meter a wide range of loads up to 200 amperes. Damping is provided by two high energy *Alnico* magnets, above and below the disc, insuring calibration stability and substantial freedom from tilt error. Arc-resistant insulation and self-contained arc gaps by-pass electrical disturbances.

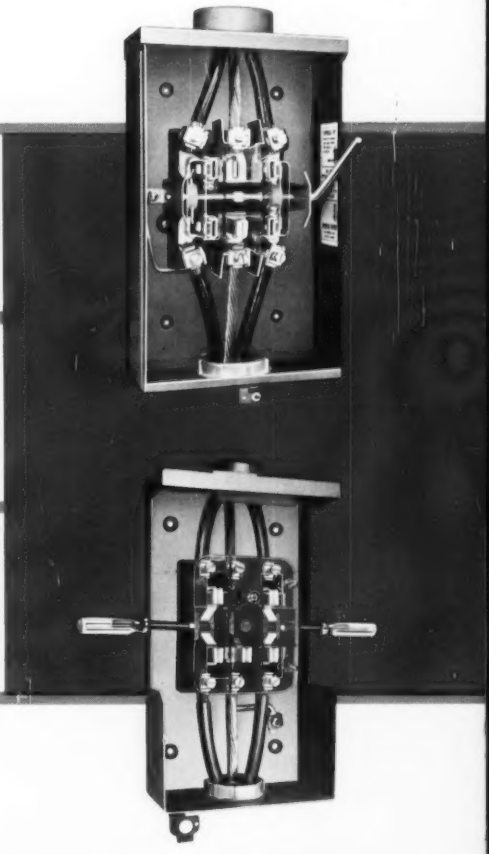
Simplification of design results in a minimum number of parts, improving reliability and reducing the necessity for repairs, but making any needed maintenance convenient. A three-position cover ring . . . worm wheel mesh, independent of the register . . . and all adjustments accessible from the front, make the MK a convenient meter.

TYPE MK
SINGLE PHASE METERS

Class **10,**
Class **100,** and
Class **200**

meet increasing loads

with DUNCAN Extended Range Single Phase Meters and Mounting Devices with 200 Ampere Capacity.



For sustained or "high load factor loads" up to 200 amperes capacity. **HQ-5** **HQ-7**

For diversified demand or "low load factor loads" *Up to* *200 amperes* **MD-5** *175 amperes* **MD-7**

LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

DUNCAN ELECTRIC CO., INC. LAFAYETTE, INDIANA

DUNCAN ELECTRIC CO., INC.
LAFAYETTE, INDIANA

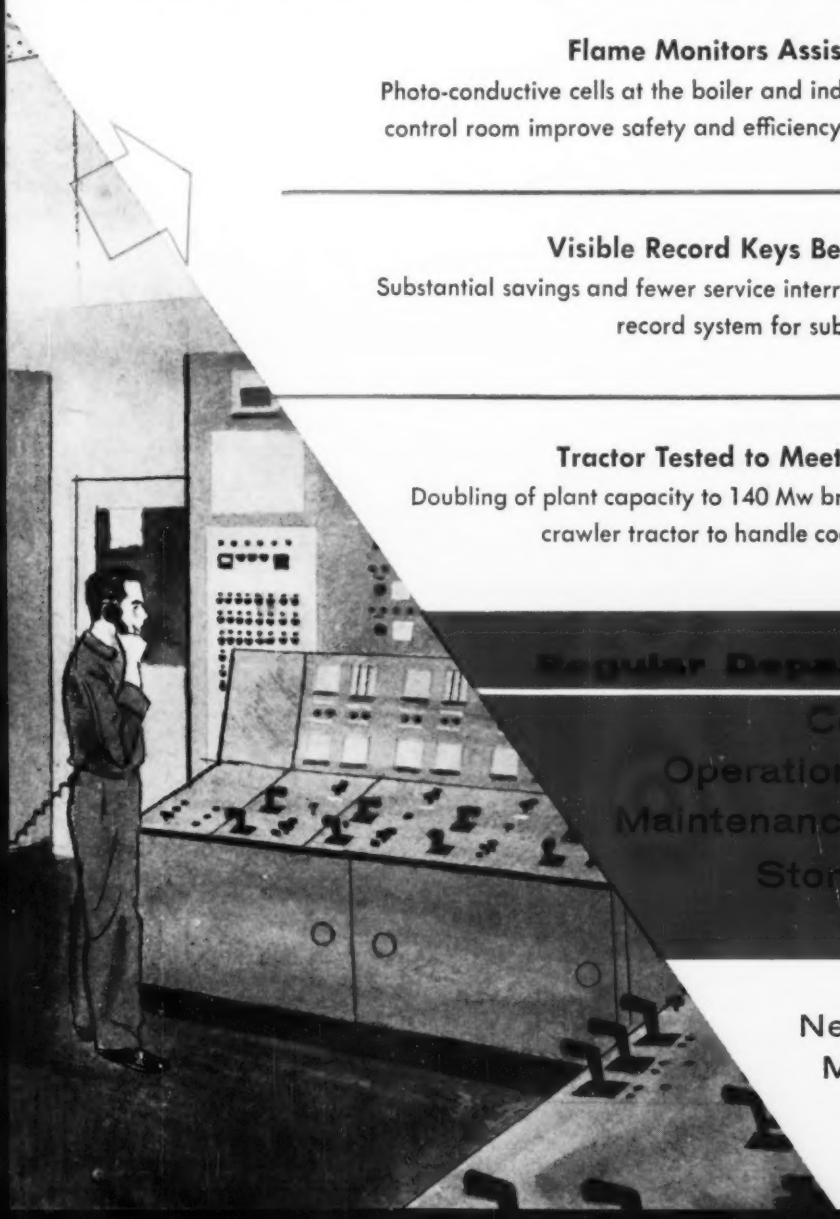
Electrical World Report

JANUARY
FEBRUARY

1960

ELECTRIC utility methods

CONSTRUCTION • OPERATION • MAINTENANCE



Flame Monitors Assist Boiler Operator
Photo-conductive cells at the boiler and indicating meters in the control room improve safety and efficiency of coal-fired boilers — p 112

Visible Record Keys Better Maintenance
Substantial savings and fewer service interruptions follow use of record system for substation maintenance — p 114

Tractor Tested to Meet Plant Expansion
Doubling of plant capacity to 140 Mw brought the need for a crawler tractor to handle coal at 600 tons per hr — p 116

Regular Departments

Construction — p 120
Operation & Testing — p 126
Maintenance & Repair — p 133
Stores & Shops — p 140
Safety — p 144

New Equipment — p 101
Manufacturers Literature — p 138

Model 1035B, designed for all electrical distribution line work.

Want to cut your line work costs in half? Let SKYWORKER show you how...

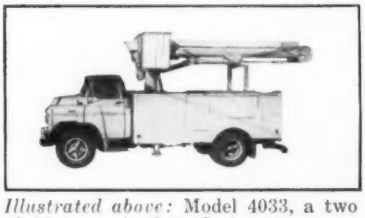
Every time a line truck is replaced with a SKYWORKER, men are utilized more efficiently. Leading utilities have proven this.

They have found, in fact, that crews equipped with SKYWORKER aerial lifts have, on an average, completed assignments in 50% of the time required by crews conventionally equipped.

A SKYWORKER crew requires fewer men, too . . . a fact which provides important savings in wages and fringe benefits. Men are released for other jobs such as growth construction.

SKYWORKER equipped crews are setting new safety records every day. Linemen aloft in a SKYWORKER work virtually without fatigue. Movement from one work position to another is accomplished with a touch of the controls. Both work platform and outer boom have high dielectric strength.

SKYWORKERS are available on purchase, lease and lease-purchase plans at surprisingly low cost. Write today for a complete file on SKYWORKER including literature, specifications, article reprints and prices. Or, if you prefer, phone Hartford, CHapel 9-0671. **Emhart Manufacturing Company, Skyworker Division, 762 Windsor Street, Hartford 1, Conn.**



Illustrated above: Model 4033, a two platform unit for placing two men aloft.

NEW SKYWORKER FILM AVAILABLE . . . WRITE!

EMHART

NEW EQUIPMENT

To obtain more information, use code numbers indicated for each item when filling in Reader Service Card

Nuclear Probe . . .

. . . determines density of coal in pounds per cubic foot. Model P20 density probe containing three Geiger-Mueller counters and a gamma-emitting radioactive source is lowered into a 1½-in. access tube driven into coal pile. Readings from the probe are indicated on the Model 2800 portable scaler, with density found by applying the counts-per-minute reading to a calibration curve. Calibration can be reproduced routinely in the field within 2%. The probe packs into one case for carrying, the scaler into another, each weighing about 35 lb.
Nuclear-Chicago Corp, 359 E. Howard Ave, Des Plaines, Ill. (1)

Terminal Spreader . . .

. . . for mid-span taps to spun or tri-plex secondaries holds hot conductors safely away from neutral. The Multiplex Terminal Spreader, consisting of three semi-rigid polyethylene tubes, has been used on spun secondaries consisting of ⅜-in. messenger, No. 2 all-aluminum neutral and 2/0 insulated all-aluminum. An experienced lineman reportedly can make a mid-span tap with the spreader in less than 20 min.
Multiplex Spreader Co, Rte. 1, Box 1056, Gresham, Ore. (2)

Rolling Chopper . . .

. . . cuts a 7-ft swath along r/w, killing growth to 6 in. in dia by cutting and fracturing and by chopping smaller growth completely. The Model SS-7 has ten reversible cutting blades of alloy steel. When filled with water, it weighs about 12,000 lb. Designed for use with D6 or D4 tractors, the chopper easily attaches to standard drawbars.
Fleco Corp, Box 2370, Jacksonville, Fla. (3)

(More New Equipment on page 103)

MSA SAFETY EQUIPMENT HEADQUARTERS

MSA backs up its label with:
selection—quality—research—experience

NEW M-S-A® CURVED FINGER LINEMEN'S GLOVES REDUCE FINGER FATIGUE

Linemen wearing new M-S-A Curved Finger Rubber Gloves work safer, faster, longer, and more comfortably than ever before. There's ample space now between the well-rounded lengths of the fingers. This new design principle practically eliminates finger fatigue. The standard color of these gloves is black. A special glove may be had that is molded with a caution color underneath which shows when the black top is worn down.

M-S-A® Leather Protectors made of finest flesh side split horsehide with cowhide cuffs, wear smooth, dry out soft, and will not harden after exposure to water. Tailor-made exclusively to fit exact contour of M-S-A Linemen's Gloves, M-S-A Leather Protectors guarantee 100% fit. They shield against mechanical injury, reduce ozone cutting. 10-inch and 12¾-inch cuffs available.

When gloves are not in use, M-S-A® Canvas Glove Bags make ideal protective containers. Snap hooks and "D" ring enable linemen to attach bag to belt.

Clip coupon below for more information. Mine Safety Appliances Company, Pittsburgh 8, Pennsylvania. In Canada, Mine Safety Appliances Company of Canada, Limited, Toronto 4, Ontario.

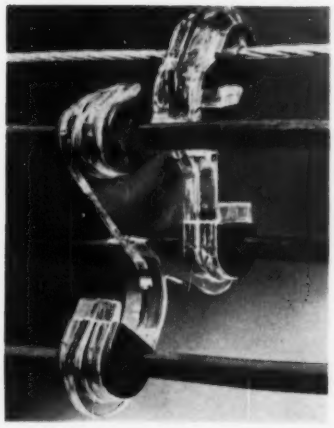
Made to ASTM Spec. D-120, these curved finger rubber gloves increase wearer comfort and convenience without sacrificing safety or durability

Mine Safety Appliances Company
201 North Braddock Avenue
Pittsburgh 8, Pennsylvania

☐ Please send me new Linemen's Glove bulletin containing size, price and shipping info.
☐ Please have MSA Representative call.

Name_____
Title_____
Company_____
City_____ Zone____ State_____

CIRCLE 102 ON READER SERVICE CARD

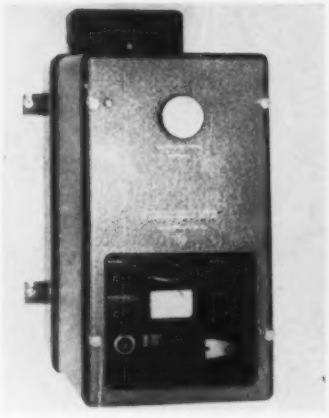


Spacer System . . .

. . . for aerial cables is one-piece Plexiglas unit with high-strength, low-resistance aluminum messenger, neoprene grommets, and a variety of aluminum phase conductor constructions. One cable can be handled at a time during quick installation of the overhead system. The unit is designed for systems operating at 5 to 15 kv. **Kaiser Aluminum & Chemical Corp, 1924 Broadway, Oakland 12, Calif. (4)**

Overspeed Monitor...

. . . for steam turbines provides quick, accurate protection from excessive speeds. The monitor (Type FDW) uses a tacho-generator, coupled to the turbine shaft, which delivers an ac voltage. After differentiation, a dc voltage is obtained which represents the rate of change of the turbine speed. If this exceeds a given limit, a normally-closed relay drops, reducing steam supply. **Rohde & Schwarz, Box 275, Passaic, N. J. (5)**

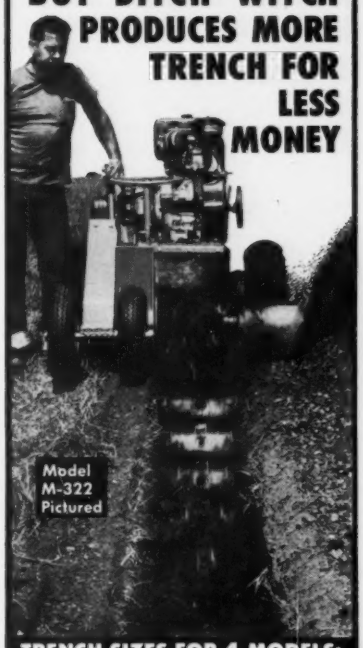


Stringing Block . . .

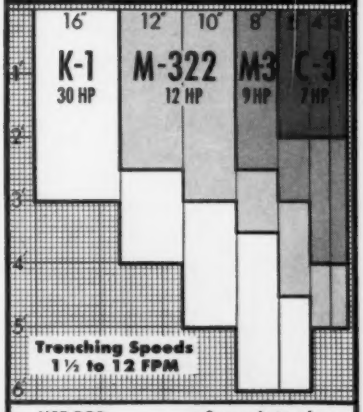
. . . for bundled conductors has two 18-in. conductor sheaves on fixed centers and a center drum roller for the winch line. As the sheaves are advanced, the V-shaped spreader bar passes through the block, riding over sheaves and drum. Time is saved when sheaves are strung at the same time. Blocks are suitable for regular or tension stringing. **Campbell Specialty Co, Inc, Okmulgee, Okla. (6)**

(More New Equipment on page 104)

"More or Less"
THE BEST
DITCH WITCH
TRENCHER
Other trenchers cost "More or Less"
Other trenchers dig "More or Less"
BUT DITCH WITCH PRODUCES MORE TRENCH FOR LESS MONEY



TRENCH SIZES FOR 4 MODELS:



USE FOR:
• Utility Services
• Gathering Lines
• Signal Lines
• Sewer Laterals
• Road Crossings
• Sprinklers
• Footings, etc.

CHARLES Machine Works, Inc.
637 Birch St. • Perry, Okla.

To Locate Distributor, Look Under "Contractors Equipment" in 1960 Metropolitan Telephone Directory Yellow Pages for Ditch Witch Trademark; or Call Collect FE 6-4404, Perry, Okla.

NOW

NOW

SILENT HOIST

KRANE KAR

360° SWING!

Boom pivoted well forward to provide working reach of ENTIRE BOOM LENGTH!

Dual traction tires for high flotation, maximum protection against blow-out upsets

KRANE KAR Operator has UNOBSTRUCTED VISION of Load and Crane at all times.

"BONUS" CAPACITY
With hydraulic outriggers, step up working capacity to 24,000 lbs. . . . biggest value on market.

360° BOOM ROTATION
Continual rotation on heavy-duty ballbearing turntable.

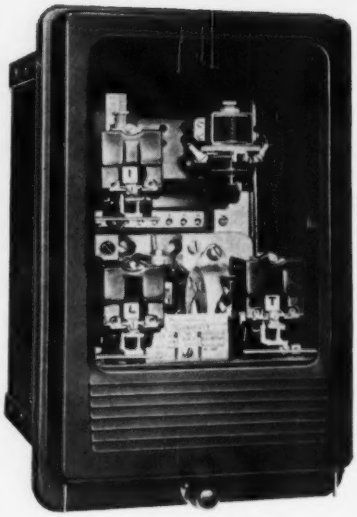
2 SIZES:
MODEL FAX—12,000 lbs. Cap.
MODEL FAY—20,000 lbs. Cap.

NOW! . . . another addition to the famous family of SILENT HOIST KRANE KARs . . . the original Mobile Power Swing Boom Crane!

SILENT HOIST enters its 41st year of Service to Industry by introducing the all-new KRANE KAR . . . all-hydraulic 360° Continuous Revolving Crane.

For complete details on this unique Crane, write today for illustrated Bulletin No. 99.

SILENT HOIST & CRANE CO.
BROOKLYN 20, N. Y.



Relay . . .

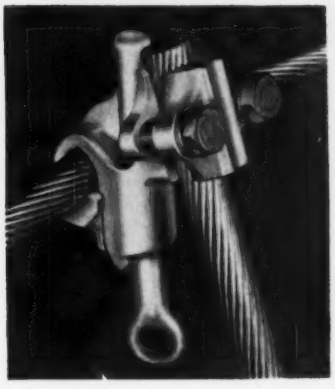
. . . **protects motors** from very light to heavy overloads. Known as the COM-5, it combines several elements to match the motor heating curve more closely. From minimum pickup to 175% of tap value setting an alarm is sounded and an operator is allowed 5 to 10 min to remove the trouble.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa. (7)

Pipe Finder . . .

. . . **is combined with a leak detector** in a transistorized dual-purpose instrument with independent circuits for each operation. Use of materials such as fiberglass cases and single turn solid aluminum detecting loops produce high accuracy, depth penetration and dependability under field conditions. Weighing 12 lb, the unit can operate for more

than 1500 hr, due to extended battery life caused by the use of transistors.
Fisher Research Laboratory, Inc, Palo Alto, Calif. (8)



Tap Clamp . . .

. . . of aluminum accommodates main line wires in sizes from No. 2 to 397.5 MCM ACSR. Advantageous where corrosion problems exist, the clamps have extra wide clamp jaws which make maximum contact with the outside strands of the main line conductor. Minimum tap size is No. 4 solid.
A. B. Chance Co, Centralia, Mo. (9)

Current Transformer..

. . . is used for extending ammeters, range, as well as to provide operating current for relays. The "Donut" transformers (Series 700) are available in ratios from 10/5 to 5,000/5, with burden ratings of 2.5 to 12.5 kv.
Associated Research, Inc, 3777 W Belmont Ave, Chicago 18, Ill. (10)

(More New Equipment on p 106)

Consider the many features of this NEW S & R 78 SERIES

Designed and engineered specifically for tension stringing . . . lightweight — extremely rugged.

Sheave has permanently bonded Type GNA **Neoprene lining** — provides maximum protection to conductor. Sheave is mounted on shielded ball bearings.

All high strength aluminum alloy rib reinforced construction with built-in conductor guard and handles. Drop forged fittings. Safety locking, hinged side strap.

35,000 lbs. ultimate strength.
Sizes through 28" diameter . . . for all conductors through 1,780,000 C.M.

Complete Catalog on Request

Sherman & Reilly, Inc.
ENGINEERS AND MANUFACTURERS
First and Broad Streets
CHATTANOOGA 2, TENNESSEE
Telephone AMherst 7-1273

PROTECT— AND DECORATE, TOO

With Subox—The Paint That's Different

1. Subox is the only paint in America made with suboxide of lead. Because it continues to be chemically active after drying, it gives more anti-corrosive protection — clings better to the small surfaces of fence wire. A single coat lasts many years.

2. Subox makes fence painting easy and economical. It can be brushed or sprayed on, but it is applied especially fast with a roller or an ordinary floor broom.

3. The most popular shade of Subox (Subalox 508) closely resembles weathered galvanizing. It is an ideal spot paint for all galvanized surfaces. Subox also is available in a wide range of modern pastel and dark colors.

Write today for technical literature, color card and the booklet "Simplified Fence Painting."

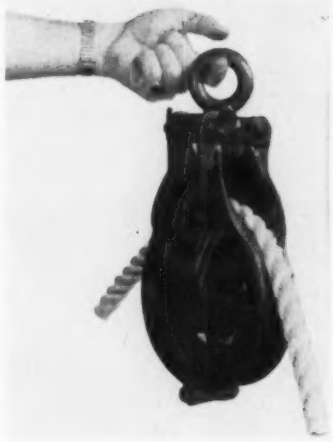
SUBOX PAINTS

Subox Inc.

Established 1924

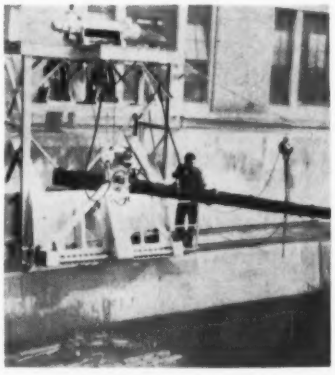
3 Fairmount Plant, Hackensack, N. J.

Subox Company of Canada, Weston, Toronto 15



Durolite Block . . .

. . . for synthetic fibers or manila ropes is 8 in. high and weighs 27 lb. Equipped with tapered roller bearings, the block has a wide flange sheave and throat housing. It can be furnished with a rope-bearing swivel eye, pin-bearing eye or swivel hook. **Sauerman Bros, Inc, 620 S 28th Ave, Dept EWN, Bellwood, Ill. (11)**



Rack Rake . . .

. . . incorporates a digging section to remove trash from the bottom of the racks, keeping their full length clear. The hydraulically-operated unit, adaptable to installations where trash removal from water inlet racks is a problem, can be furnished with hoist carriages, moving apron or trash hopper.
Portland Co, 58 Fore St, Portland 6, Me. (12)

Gas Load Break . . .

. . . for load-switching open dropout fuse cutouts gives linemen greater control, because the switchstick is used in the same ring that operates the fuseholder or disconnect blade. A Monel cylinder in the fuseholder's upper

contact makes each open-type cutout a load break switch. The cutouts are used as low-cost switching mechanisms on branch and feeder circuits and capacitor and transformer banks.
General Electric Co, Schenectady 5, N. Y. (13)

Safety Caps . . .

. . . are individually dielectrically tested to meet E.E.I. Specification AP-1 1959. Called "Dielectric Hedgard," the line of caps is lightweight, has no metal parts, and will withstand repeated 40-lb impacts. Snap-in suspension permits adjustment for head sizes 6½ to 7¾.
Davis Emergency Equipment Co, Inc, 45 Halleck St, Newark 4, N. J. (14)

(More New Equipment on p 108)

ESPRIT DE CORPS

It isn't every day that you find a group of people doing a good job not only because they're paid to—but because they *want* to. We're blessed with such a group at Fisher-Pierce, and the way they assemble, inspect and test F-P photoelectric streetlight controls makes you think that they personally and individually guarantee every one. In a sense, of course, they do. And while this might seem like too much fussyness to some people, the line foremen would a lot rather see it this way than their not being fussy enough.

So all this makes life easier for Fisher-Pierce, you may say, but what difference does it make to me? For one thing, it greatly raises the odds of the controls passing your incoming inspection. (Before our inspectors let them go, the controls have not only come under several sets of practiced eyes, but have been "run in" on cycling tests that are equivalent to a couple of months of turn-on and turn-off.) And there are also some proven manufacturing processes that go hand-in-hand with this "quality-consciousness": use of heat sinks to protect the CdS cells while the leads are soldered; 100% hi-pot testing; pressurized-solvent cleaning of relay contacts after hi-pot testing. As much as possible, one person is responsible for a group of related assembly operations, instead of just tightening one nut all day long.

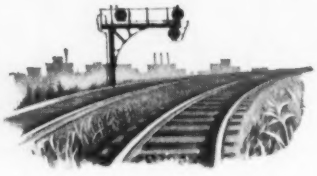
The net result of this "esprit de corps", in our opinion, is a better control for your money. When the builders pay attention to their jobs—whether the foreman is looking over their shoulder or not—they're working for your benefit as much as ours. The Fisher-Pierce Co., 82 Pearl St., So. Braintree 85, Mass.

FP
FISHER PIERCE
PHOTOELECTRIC LIGHTING CONTROLS
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

Whatever your brush problem

Line?

Roadside?



Right-of-way?

WEEDONE can solve it!

With the right background—Chemical control of weeds and brush has developed along established lines of procedures and practices. Amchem initially pioneered the major advances in the field, has originated many of today's accepted procedures and products for efficient, economical weed and brush control. Your problems are in *experienced* hands when you hand them to Amchem!

With the right approach—Amchem's corps of weed and brush specialists are basically application specialists. Combining comprehensive theoretical and practical experience they are able to offer all industry a realistic approach to *any* weed or brush problem. These specialists have developed a variety of efficient weed and brush eradication programs over thousands of miles of line, roadside and right-of-way areas once choked and inoperable due to infestation.

With the right product—Amchem's tremendously diversified product line is your assurance that the right weed and brush killer is available and will be utilized for your specific problem. Weedone Brush Killers, for example, have been used in the field for years and proven eminently successful in eliminating weeds and brush wherever they are a problem. Why not bring your problems to Amchem?

Amchem and Weedone are registered trademarks of Amchem Products, Inc.

AMCHEM PRODUCTS, INC.
AMBLER, PA.

Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

AMCHEM

WEEDONE

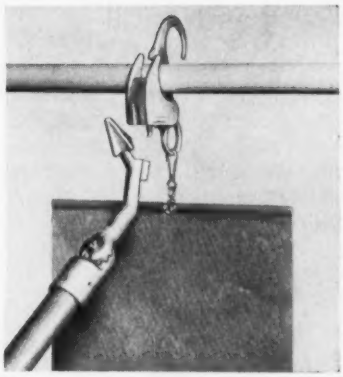
BRUSH KILLERS

another chemical development of

Amchem Products, Inc.

(Formerly American Chemical Paint Co.)

St. Joseph, Mo. • AMBLER, PA. • Niles, Calif.



Red Marker Flag . . .

. . . indicating which buses are hot can be installed and removed with a hot stick. Made of semi-flexible plastic, the flag gives off an audible signal in the breeze. The marker's clamp, principally aluminum alloy, has spring actuated jaws which are released when a trigger is pushed.
Bodendieck Tool Co, Rte 48 North, Taylorville, Ill. (15)

Cable Spreader . . .

. . . provides long-term dielectric and mechanical strength. The porcelain unit (Type S-1), is mechanically capable of withstanding forces generated by faults in excess of 10,000 amp and will support minimum dead weight loads of 1,500 lb. The porcelain and "V" groove jaw design eliminates grommets.
Fargo Mfg Co, Inc, 845 Main St, Poughkeepsie, N. Y. (16)

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All
Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD FLEXIBLE CAPTURED FLEXIBLE FREE

JASPER BLACKBURN CORPORATION 1525 Woodson Rd., St. Louis 14, Mo., WYdown 3-9430.

New screw anchors are installed in minutes with hole-boring equipment.

Power-Installed Screw Anchors average 5 to 8 man-minutes for complete installation

TYPICAL INSTALLATION TIME*

No. of Men	Total Time	Man-Minutes
	78 Square Inch Anchors	
2	1½ minutes	3
2	2¾ minutes	5½
	100 Square Inch Anchors	
2	2 minutes	4
2	2½ minutes	5
	143 Square Inch Anchors	
2	2¼ minutes	4½
2	3 minutes	6
2	3½ minutes	7
	176 Square Inch Anchors	
2	3 minutes	6
2	5 minutes	10

*Variation in installation time for given anchor sizes indicates various soil conditions and different types of installing units.

Latest advance in anchoring technique speeds line construction . . . realizes greater value from investment in hole-boring equipment

If your company uses power hole-digging equipment for line construction, you can now use that equipment to install the new line of Chance Screw Anchors.

Chance Power-Installed Screw Anchors, ranging from 78 to 176 square inches in area, can be speedily installed in all types of soil, except extremely rocky soil. Your present power boring equipment, regardless of type, can be easily adapted to power anchor installation. Only one new part is needed—the wrench shown on the next page. This wrench transmits torque from the power equipment directly to the specially designed hub on the anchor helix. Since the anchor rod is not subjected to torque, it only has to be heavy enough to support the guy load—a cost-saving factor.

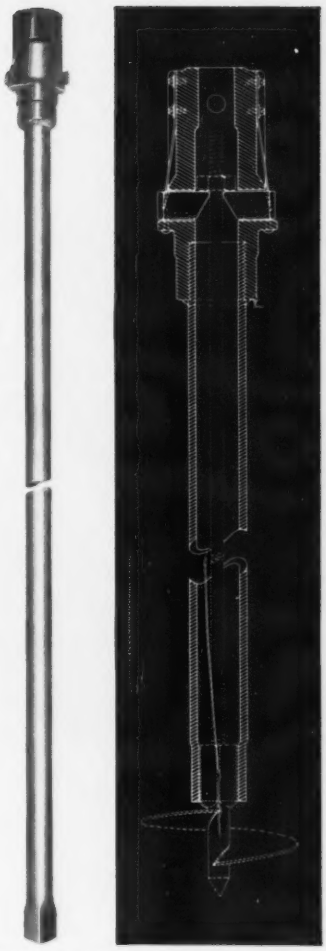
Installation procedure is extremely simple. *Step one* is to remove the Thimbleye or Twineye nut and slide wrench on the anchor. *Step two* is to fasten the wrench to the "Kelly Bar" of the power-digger, or, to fasten the wrench on the pilot bit of the auger using an adapter. *Step three* is to drive the anchor with the power equipment.

Step four is to release the wrench from the anchor and retrieve it from the ground. (The spring-loaded "dogs" that lock rod in position are easy to release.) *Step five* is simply replacing the Thimbleye on the end of the rod—your anchor is ready for hooking up the guy wire.

These five steps are accomplished in a matter of minutes. Repeated time tests in various types of soil prove that Power-Installed Screw Anchors averaged only 5 to 8 man-minutes for a complete installation—*from the time the equipment was moved into position until the anchor was ready for the guy!* The typical installation time tables at the left show actual times clocked during tests with power company personnel.

PULL TESTS PROVE HOLDING POWER

During the engineering and development stages of these Power-Installed Anchors, several hundred tests were made to check the anchoring dependability of power-installed screw anchors. Each anchor was pulled by the mobile testing unit shown below to determine maximum holding power. The Pull Test Data Tables at lower right show the results of typical pull-tests. Complete test data is given in Bulletin 868. Address your bulletin request to . . .



THE ONLY PART NEEDED is this special wrench. (Diagram shows how it fits the anchor.) Wrenches are made to fit all popular makes of earth-borers.

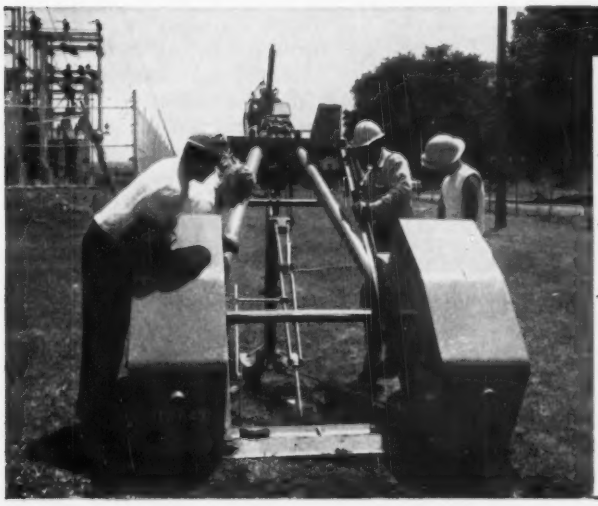
THIMBLEYE and TWINEYE guy-wire nuts are available. They distribute pulling stresses uniformly and keep guy wire from spreading, kinking, or bending.

SHARP CUTTING HELIX of high strength structural steel is tapered to minimize earth disturbance. Special hub fits lower part of wrench.

A. B. CHANCE COMPANY CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

CA59-23



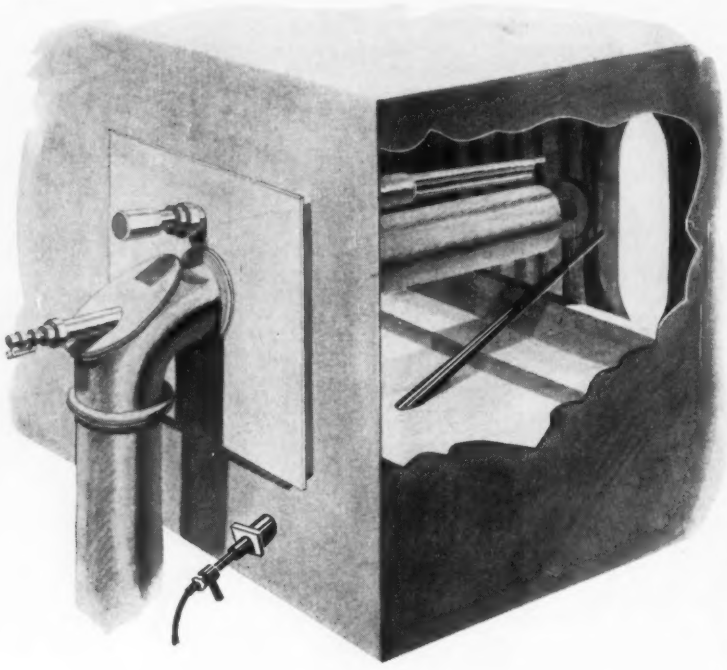
PULL TEST DATA

	Load at Creep*, Lbs.	Pull-out Load**, Lbs.
78 Sq. In. Anchors	17400	17800
	13900	14900
	17600	20000
100 Sq. In. Anchors	20000	21500
	17800	18400
	21000	21500
143 Sq. In. Anchors	17600	18600
	23600	25100
	21600	22600
176 Sq. In. Anchors	24300	25300
	22000	24200
	22000	24200

Load at Creep*—Test gauge reading closest to 4" creep. Allows for rod-stretch and initial settling of anchor.

Pull-out Load**—Anchor continued to creep when load was sustained at this figure.

For ultimate Soil-Anchor holding strengths in different soil classes see the Chance Catalog.



Flame Detectors Assist Boiler Operator

J. U. BALEY, Asst General Supt, Electric Operations,
Baltimore Gas & Electric Co, Baltimore, Md.

Flame detection and indicating equipment is a positive means of assisting operators in the safe and efficient operation of coal-fired boilers. The equipment provides auxiliary and continuously-reliable information to the operator isolated in the central control room. This is the conclusion of Baltimore Gas & Electric Co, based on experience with flame-monitoring equipment on two boilers in their new Herbert A. Wagner Station.

The initial installation, in February, 1956, was on a 950,000-lb/hr radiant boiler with a divided furnace fired by pulverized coal through 16 circular burners arranged in four levels. Light oil torches, spark ignited, light off each burner. An investigation of devices for flame monitoring showed a favorable possibility of distinguishing individual flames with light-detecting devices using photoelectric or photo-conductive cells as sensing elements.

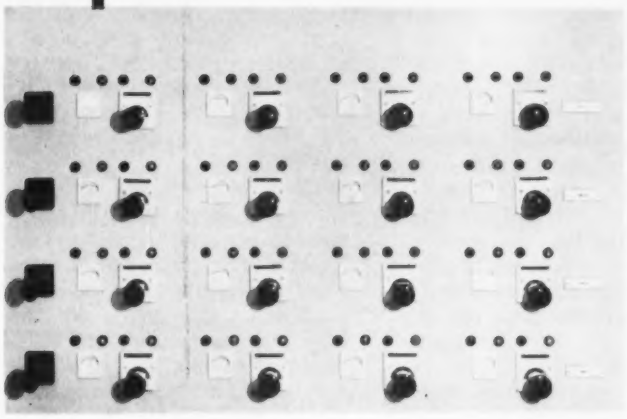
Preliminary trials proved the practicability of using a photo-conductive (lead-sulphide) cell sighted on the flame. It was decided to install one detector in each of the lower four burners of No. 1 boiler. These burners were selected because they are used to raise pressure in a cold boiler, a period considered to be most critical from the standpoint of furnace explosion.

A sighting tube for each light detector is focused on the coal flame at a point about 20 in. from the burner tip, with the line of vision terminating at either a side wall or the division wall. As the flame of the oil ignition torch is included, supervision of the lighting-off equipment also is provided.

The control room operator receives indication of burner conditions through "on" and "off" lights, a small voltmeter for each burner, and an annunciator alarm. Indicators are located on the vertical panel directly behind the pulverizer section of the control bench board.

Certain operating troubles appeared and were corrected. The sighting tube, which protrudes through the burner approach cone, was subject to fly-ash plugging. These tubes now are equipped with small compressed air connections outside the burner windbox. A timing device periodically puffs out and keeps the tubes free from accumulations.

An insulating spacer was in-



CONTROL ROOM OPERATOR has a visual display of burner conditions on a panel located behind the pulverizer section of the board

ON AND OFF LIGHTS and a voltmeter are provided for each burner. Readings call attention to possible burner malfunctions

stalled to protect the lead-sulphide element from conductive heat from the windbox enclosure. To eliminate dirty contacts in relays, enclosures for this type of service were added. Finally, to eliminate the effect of adjacent burners, considerable "cut and try" orificing of individual sighting tubes was necessary.

For the installation of detecting devices on No. 2 boiler, the boiler manufacturer reoriented the lighting-off torches on some burners. Further work was necessary only to improve discrimination between burners.

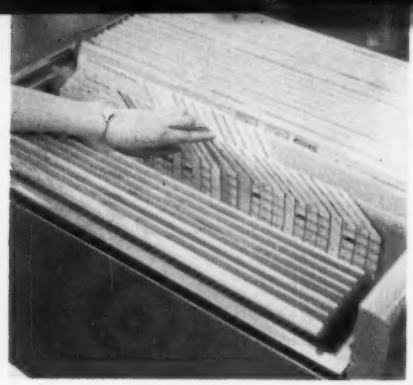
The devices have proven to be a reliable and useful guide to the operators. From the control room, the operator can determine if the proper oil torches are lit before starting the coal feeders to a pulverizer. With experience he can interpret erratic signals of the individual burner voltmeters as boiler malfunctions, such as a coked burner, which require the immediate attention of an auxiliary operator for burner adjustment.

The purpose of the devices, however, is not to take the responsibility for safe operation away from the operator. Thus, provisions for lighting ignition oil torches have been made only on panel boards at each respective burner level. It is necessary that an auxiliary operator "light-off" and observe directly that torches are operating properly before a pulverizer is started.

Included in these installations are starting interlocks which require that oil torches be "proved in" before the respective pulverizer can be operated. While this interlock has performed satisfactorily, it does not override the requirement of visual inspection of the "light-off" flame, backed up by the observation of the indicators in the control room.

Record System Keys Substation Maintenance

WILLARD TWYMAN, Senior Accountant, Public Service Co of Indiana, Plainfield, Indiana



A new substation preventative maintenance program aimed at standardizing test practices and procedures for greater efficiency involves two key factors: Maintenance and test policies that insure maximum economic life of equipment; and a record system which provides a maintenance history and a basis for evaluation of the entire program. Although this program has been in effect only a short time at Public Service Co of Indiana, it already has brought substantial savings and a reduction in service interruptions.

The maintenance and test program was established through the efforts of a substation maintenance committee headed by the system substation superintendent and including division substation supervisors and the system test engineer. The committee is assisted by accounting personnel and is supervised by the system services and operation director.

The group first evaluated existing practices through contacts with neighboring utilities, review of manufacturers' recommendation and discussion with experienced company personnel. As a result, many existing procedures were revised, testing as a criterion for maintenance scheduling received more emphasis, and a record system was developed.

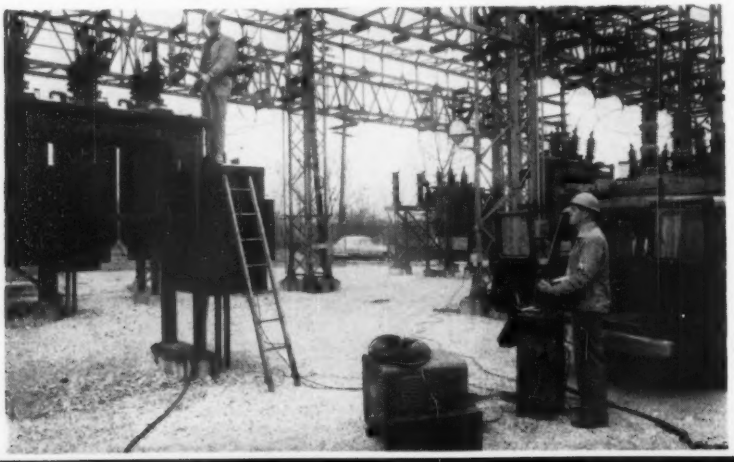
At Public Service Co, substation maintenance is the responsibility of division substation supervisors headquartered in each of the three operating divisions. Each division is divided into three or four substation maintenance areas under a foreman headquartered in the area, with sub-areas in some cases. The need for central supervisory control and the impracticability of a number of small record systems made it necessary to place maintenance records at division headquarters. Execution of maintenance schedules and the smooth flow of paper-work are the responsibility of area foremen and, in some cases, an area mechanic.

The record system is an important aid to the maintenance program. It was designed to provide for automatic scheduling of jobs, with a maintenance history record and complete nameplate data for each major piece of equipment. Report forms were redesigned or new forms developed to provide for the proper data and to facilitate and simplify the recording of maintenance work and test data. Specific reports were created for inspection of each major type of equipment. Where possible, check-list report forms are used to encourage in-the-field preparation and to minimize handwritten data. Forms follow the maintenance manual job specifications.

A filing system for fast reference was established, with division files organized by maintenance areas and by substations within the areas. Equipment records, in a different color for each major type of equipment, are arranged alphabetically under the substations. Thus, analysis may be made by equipment classifications, substations or maintenance areas. Each card has a visible margin for fast reference.

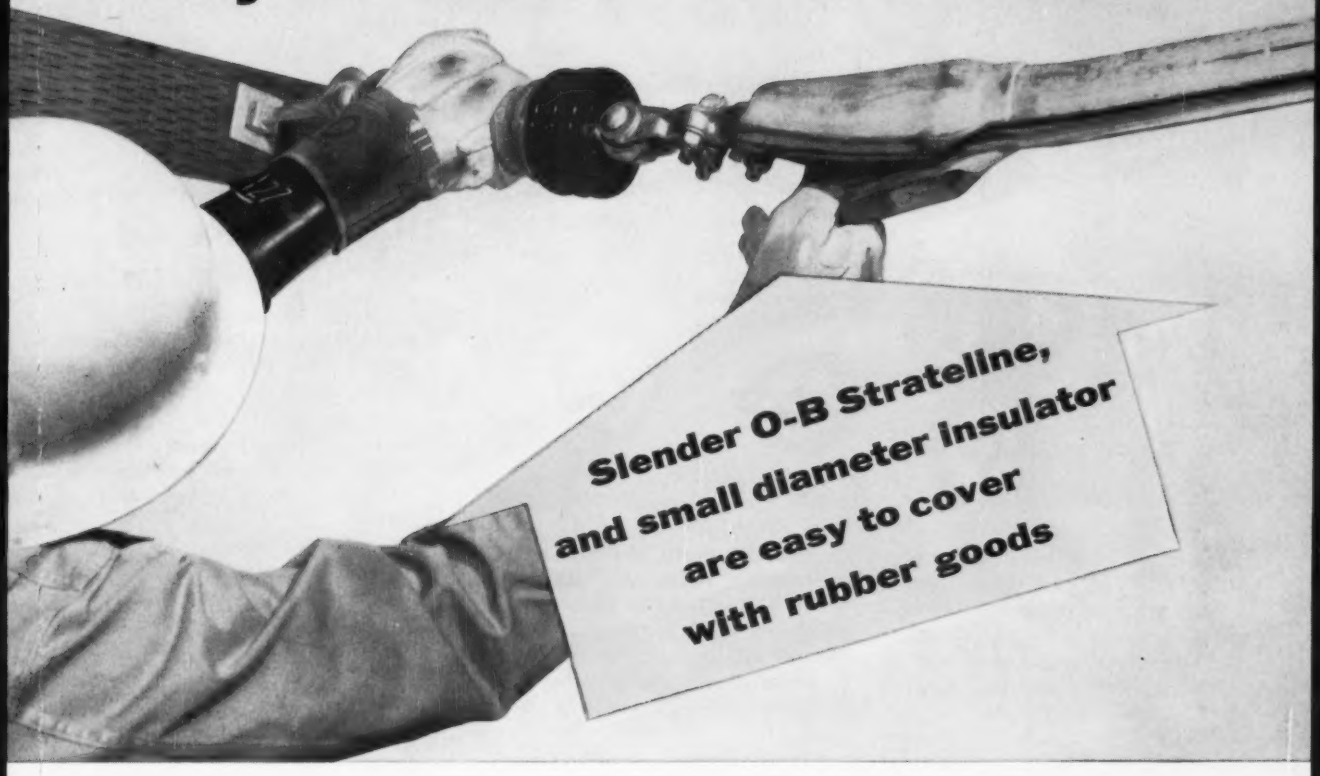
Scheduling is accomplished by using movable colored signals on the maintenance and test records. Monthly schedules are prepared by substation for each maintenance area, and sent to the foreman in the preceeding month. Jobs are scheduled at division headquarters by months, with the area foreman setting the exact date best suitable for the work. Jobs not completed during the month scheduled are rescheduled under a plan established for that purpose.

In posting job results to the maintenance and test record, only important data are transcribed. Job report forms are retained in a supplemental file, as a part of the record system until superseded by a more current report. Bushing data and specifications, including replacements and equivalents, and other historical information of the equipment and its maintenance are a permanent part of the system. Records are transferred with equipment moved between substations or from one division to another to insure a permanent and complete history. The record system was supplied by VISIrecord, Inc.



CIRCLE 114 ON READER SERVICE CARD

They're made to work hot!



For deadends that have to be worked hot, here's the ideal insulator-hardware combination:

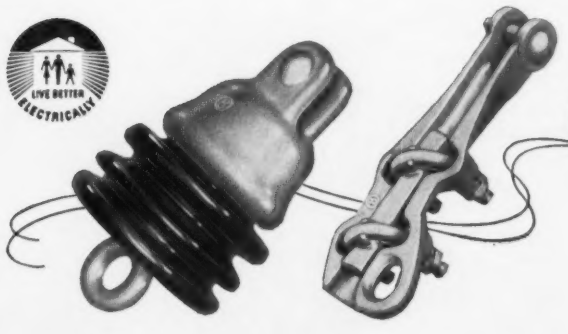
1 -- The O-B Strateline clamp
2 -- The O-B 4¼-inch diameter insulator

Before the present Strateline design was approved, it was submitted to two of the leading manufacturers of hot-line tools for testing in actual applications. Their verdict: "Ideal for hot line work." Their reasons: the captive keeper piece, the long U-bolts, the conveniently located loop, the rounded nuts.

Ideal companion for the ideal clamp is the 4¼-inch-diameter Catalog 42399 insulator. It carries the same 10,000-lb. M & E rating as a standard six-inch unit. Its smaller diameter reduces the amount of clearance needed for forming jumper loops.

If you're looking for extra convenience and speed in working deadends hot, we suggest you consider these two quality items. Your local Graybar man will be glad to discuss your needs with you and to cooperate in keeping a stock of both items in his warehouse.

OHIO BRASS COMPANY, MANSFIELD, OHIO
Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.



LIVE BETTER ELECTRICALLY

These products distributed by GRAYBAR ELECTRIC COMPANY

Ohio Brass

HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

CIRCLE 115 ON READER SERVICE CARD 4954-H

Utility Tests Tractor to Meet Demands of Plant Expansion

Tractor Capacity Determined by Minnesota P&L Co

Push distance, avg	200-220 ft
Push time (3rd gear), avg	61.6 sec*
Return time (6th gear), avg	27.5 sec*
Total cycle time, avg	89 sec
Cycles per hour	39.0
Blade load, avg	16.7 tons
Production per hour	650 tons
Fuel consumption per hour	14.3 gal
Tons of coal per gallon of fuel	45.6

*Including shift time

Doubling of Minnesota Power & Light Co's Clay Boswell Steam Electric Station to 140 Mw signalled the need for a study of all components in the coal-handling operation to insure that each had sufficient capacity for the increased plant size. One new component required by the station's expansion was a tractor capable of stockpiling and reclaiming coal at the rate of 600 tons per hr. This capacity was considered sufficient to meet present and future needs. Station personnel conducted their own tests of three makes of crawler tractors.

Prior to the production study, the top of the coal pile was leveled and elevations taken with a surveyor's level. Heights were recorded every 25 ft on a grid pattern. A line was staked out on a 200-ft radius from the telescopic delivery chute. At the end of the production study period (about 2½ hr), elevations again were taken of the height to determine the coal moved but not delivered to the conveyor. The coal actually delivered to the conveyor was weighed on the belt by a weightometer.

The tractor with enough power and weight to meet the 600-ton requirement proved to be a Caterpillar D9 equipped with a 20-ft BD9U coal-handling blade. The tractor exceeded requirements by 50 tons and outproduced its nearest competitor by more than 130 tons per hr. The D9 was accepted a month later.

Another factor in the tractor requirements was the ability of a machine to clear the area below the spout quickly. During the shipping season as the stockpile grows higher, clearance under the discharge spout lessens. Thus, a tractor unable to move the coal fast enough could shut down the stockpiling operation.

Coal is brought into the plant by rail and dumped into a 16x 50-ft double-track 90-ton hopper through a 5-in. grizzly. Coal is delivered to the stockpile by a 36-in. 147-ft belt on an 18-deg incline. Powered by a 40-hp motor, the conveyor has a capacity of 600 tons per hr. A run of predominantly coarse coal is crushed before delivery to the stockpile.

During production studies of the 320-hp Caterpillar unit, engineers noted that the tractor removed coal from under the spout faster than the 600-ton belt could deliver it. At one point during the test, the tractor waited 11 min for sufficient coal to accumulate.

Combustion in the stockpile, formerly a problem, apparently has been licked, reports Plant Supt B. E. Smith. In the past, a vertical, spillgrade-type of pile was used. Larger lumps of coal tended to roll down the 2½-on-1 slope, gather in loose pockets and eventually heat up.

The 140,000-ton stockpile now is kept as flat and level as possible with a side slope ratio of 7-on-1. Coal is spread in 1-in. lifts for maximum compaction. The 30-ton tractor easily negotiates the 16-deg incline to compact the slopes. There has since been no evidence of heat in the pile, Smith said. Present generating facilities burn an average of 575 tons a day. This figure will increase substantially with operation of the second generating unit.

CLEARING AREA below the spout of the coal conveyor, tractor moved 650 tons per hr, exceeding need

COMPACTING SLOPE with 7-on-1 ratio is easy task for tractor. Coal is spread in 1-in. lifts on top of pile

CIRCLE 116 ON READER SERVICE CARD

NEW... and Improved MIF Pole Hardware

STRONGER, More Durable Installations at LESS COST

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NEW 11-SECTION CATALOG contains 8 product group sections . . . 8 new catalogs in one . . . more than a catalog, a complete working manual with product description, application data and installation procedures.

VERSATILITY-ECONOMY . . . Improved design and new developments in MIF Pole Hardware make MIF proven advantages and economies more widely applicable than ever before. More than 39 new designs in framing hardware for all types of wood structures, new aerial cable hardware, new guy and dead end attachments . . . these and many others are featured in the new MIF catalog.

STRONG-CORROSION RESISTANT . . . All designs, old and new, are of strong, tough, shock and corrosion resistant Malleable Iron. Curved and vari-planed surfaces, ribs and projections, smooth fillets, optimum distribution of material, all obtained in one casting operation, give better performance and exceptionally long life.

EASY INSTALLATION . . . An important characteristic of all designs is ease and simplicity of mounting (no special tools required), keeping installation costs to a minimum.

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Malleable Iron Fittings Company
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RESEARCH • ENGINEERING • MANUFACTURING
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CIRCLE 117 ON READER SERVICE CARD

Persons in the know
are specifying fuses

HATFIELD Electric Co.,

a leading electrical contractor,
installs—

FUSETRON dual-element Fuses

in its new office building

Mr. Brown, Vice-President tells why . . .

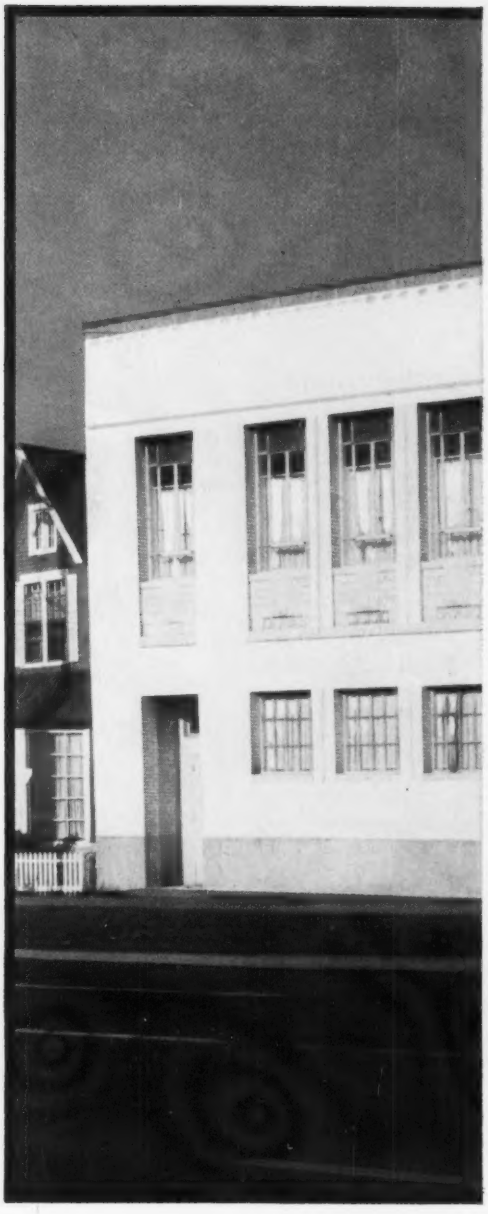
"For our own buildings and our recommendations to our industrial and commercial customers, we feel that FUSETRON fuses are the most reliable means of overcurrent protection that has been made available to us.

"We require protective devices for industrial and commercial application that not only provide adequate short-circuit protection but also protect against needless blows. In dead-front panel equipment it is especially desirable that they operate cool and efficiently. Of course FUSETRON fuses provide this.

"The additional protection features of these devices are of continual interest to our customers, and we feel their use is to our mutual benefit.

"As a matter of further interest, we are remotely mounting the fluorescent ballasts throughout our own offices and adding your fuse blocks with indicating FUSETRON fuses for better protection and lower maintenance."

William L. Brown,
V. P. HATFIELD ELECTRIC CO.
CLEVELAND, OHIO



This Hatfield Electric Co. installation underscores the need for . . .

LIFE-TIME DEPENDABILITY AND HIGH INTERRUPTING CAPACITY IN A MODERN PROTECTIVE DEVICE — *You Get Both With* FUSETRON Fuses . . .

THERE IS A BUSS OR FUSETRON FUSE FOR EVERY ELECTRICAL NEED

SAFE PROTECTION THROUGH THE YEARS . . .
without maintenance or recalibration costs.

FUSETRON fuses remain safe and accurate because, unlike mechanically operated devices, they have no hinges, pivots, latches or contacts to stick or get out of order.

FUSETRON fuses are *calibrated at the factory by engineers.* Once properly installed, they require no maintenance — no periodic inspection and accompanying down-time.

PROTECT AGAINST HIGH FAULT CURRENTS

A modern protective device must provide protection against today's heavy fault currents — and be able to protect against even greater fault currents that might develop in the future.

You get this protection with FUSETRON fuses. FUSETRON dual-element fuses have an interrupting rating of 100,000 amperes rms symmetrical.

Electrical Protection goes MODERN with FUSETRON fuses because they are adequate for today's conditions and for anticipated growth in service demands.

160

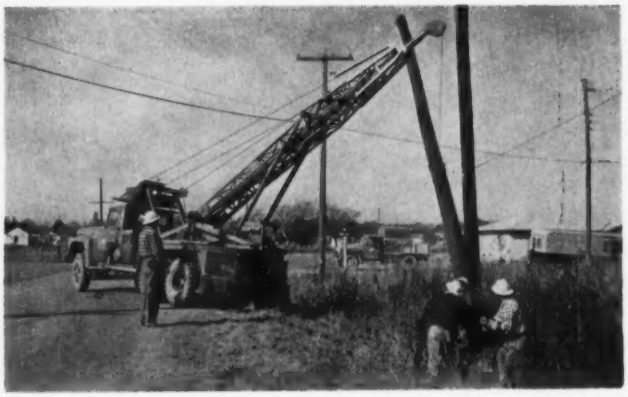
For More Information on FUSETRON dual-element fuses . . . *Write for bulletin FIS*

260

BUSSMANN MFG. DIVISION, *McGraw-Edison Co.*, St. Louis 7, Mo.

CONSTRUCTION

Special Truck Sets Distribution Poles



A special pole-setting truck and equipment handles all poles up to 75-ft long in the compact operating area of Dallas Power & Light Co. With the unit available for these jobs, the company has removed the pole-setting gear from the backs of all line trucks. The crew for this special truck consists of a driver, a foreman and four men. During pole setting, two men shovel and two tamp.

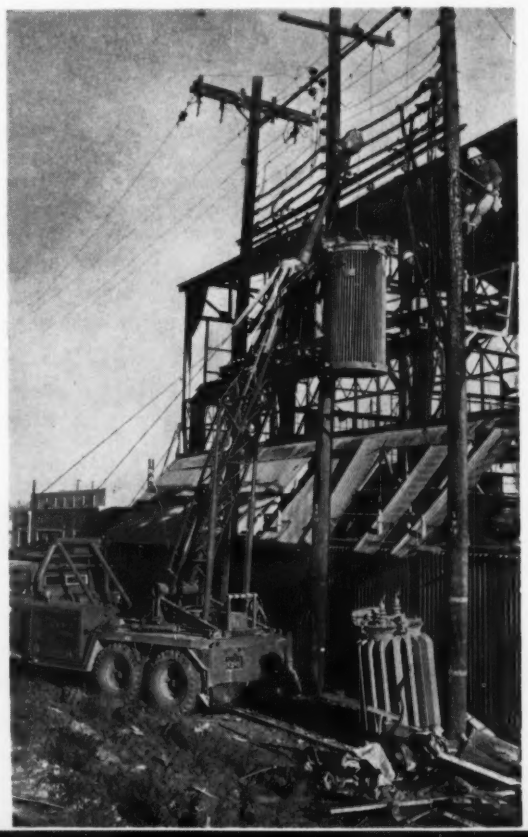
The truck was designed especially for its job. It mounts a hydraulic boom, designed and built by one of Dallas Power & Light's customers to the company's specifications. The boom is 26 ft long, with a 6-ft extension which can be run out with hydraulic controls.

The boom can be turned hydraulically up to 15 deg to either side of center. This feature eliminates the time formerly spent in positioning a line truck with a fixed boom. This rotating feature of the boom makes it particularly suited for other types of jobs, such as installing or removing transformers and other pole-top equipment that cannot be handled by a normal line-truck crew. Two steel-rope guys attached to the boom provide a safeguard in the event of failure of the hydraulic system.

There is no line-crew type of equipment carried on the special truck. Instead, the truck has a compressor for powering pneumatic air tamping equipment. A hydraulic jack, operated from the power take-off, is used for pulling poles.

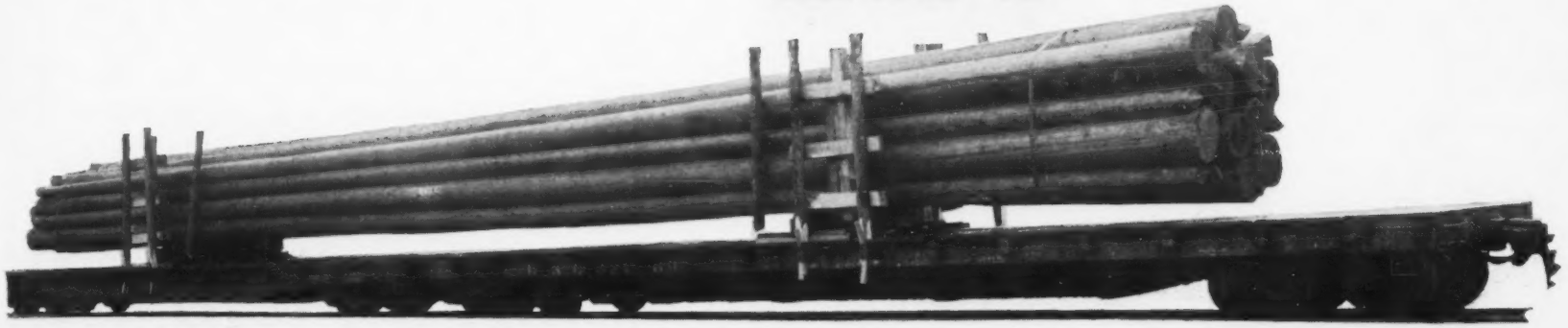
(More Construction on page 122)

HYDRAULIC BOOM can be positioned up to 15 deg on either side of center. Thus, when removing pole-top equipment, the truck need not be spotted with exactness



For long life, lower cost and less maintenance specify

WESTERN RED CEDAR Poles for EHV LINE CONSTRUCTION



EXTRA LONG POLES
Shown here on flatcars, a ready-to-go shipment of Class 1-95′ full length Penta treated poles for EHV construction.

Since 1909, producers and processors of selected quality Western Red Cedar Poles.

Bell POLES

BELL Western Red Cedar Extra Long Poles (95′-110′ or longer) full length Pentachlorophenol treated as per EEI Specification TD-100 or AWPA Specification C 8-58 Thermal Process are now available for EHV line construction and have already been specified for one power company's 460 KV experimental line. BELL'S Western Red Cedar Poles for EHV line construction give proven long life at much lower initial investment with minimum maintenance cost. Ask for recommendations based on your requirements.

For immediate information, phone FEderal 3-8277

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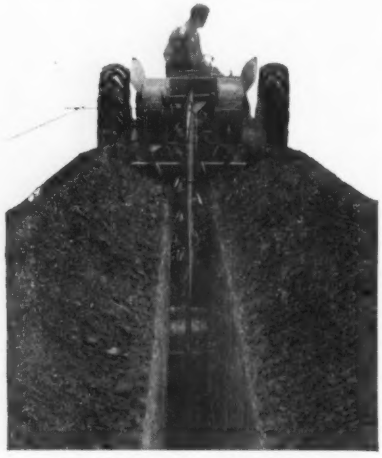
This Business of a Good Trench

Profitable trenching means doing a good job in the fastest possible time at the lowest possible cost. That's what the Auburn Gear-Draulic Trencher delivers.

Initial investment is low. It is one-man operated, requires only minimum of maintenance, and seldom has any down time. Works in soil conditions that others can't touch and handles up to 800 feet per hour. Has simple, trouble-free design with a variable speed, hydraulic drive that automatically adjusts speed to changing soil conditions. Lets you dig from 6″ to 14″ wide, down to 6′ deep. Ask any Auburn owner . . he'll recommend it.



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Send me more information on the Auburn Gear-Draulic Trencher for a_____ tractor ☐, or on the Jeep-A-Trench Model ☐.

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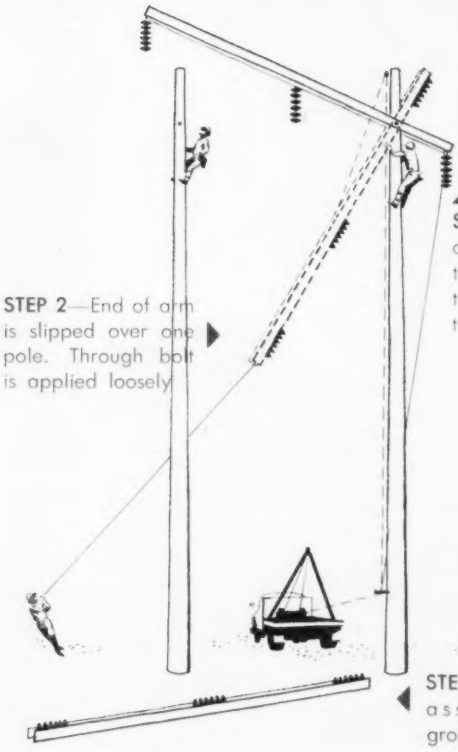
STEP 2—End of arm is slipped over one pole. Through bolt is applied loosely
STEP 3—Short end of arm is pulled by truck winch to put the other end over the second pole
STEP 1—Double arm assembled on ground with insulators is raised up the pole by the winch

Install H-Frame Arms Quickly With Three-Step Method

LEE LASH, Construction Supt, Oklahoma Gas & Electric Co, Oklahoma City, Okla.

Installation time for double arms on H-frame transmission structures has been cut to 15 min by construction crews of Oklahoma Gas & Electric Co through development of a new technique. The method is simple.

As the first step in the installation, the double arm is completely assembled on the ground, including insulator strings. Then it is raised up the pole with a pulley. The load line is attached to the center of the arm and the arm is pulled up by the truck winch.

To begin the second step in the procedure, one end of the arm is slipped over the top of the pole and the through bolt is slipped through the crossarm and the pole. The bolt is applied loosely and becomes a pivot point. Attached to the pole in this way the weight of the arm is distributed so that the long section hangs down.

As the final step in the installation, the load line is removed from the center of the arm and attached to the short end of the arm. The truck winch takes a strain on the line to pull down on the short end of the arm, raising the other over the other pole of the H-frame structure.

The whole operation is completed quickly and easily. The technique was developed by Gerald G. Rich and Henry C. Hubbard, who are members of an OG&E construction crew.

(More Construction on page 124)

Giant generator gets new coils by National

...The Specialists in electric coils/repair service

When one of Bonneville Dam's big waterwheel generators required rewinding, National's experience in coil design and production was put to work.

National built a complete set of stator windings, comprising 594 coils, plus circuit rings and connection taps and furnished complete winding supplies. All coils were given high frequency tests at 10,000 volts, to check turn-to-turn insulation, and 40,000 volt ground test A.C. 60 cycle for one minute.

National also furnished supervision for installation. Despite limitations in working space—the rotor was not removed from the machine but was jacked up sufficiently to permit winders to enter—the work was completed on schedule. Generator No. 10 is now back in service—and is running several degrees cooler than before rewinding.

Put National's broad experience to work on *your* winding needs.

For more information call National's Columbus plant... HUdson 8-1151. Or call the nearest National field engineer.

National Electric Coil

DIVISION OF McGRAW-EDISON COMPANY

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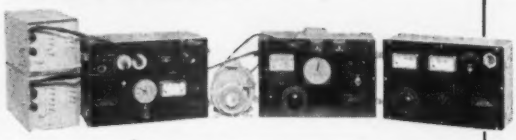
ELECTRICAL ENGINEERS • MANUFACTURERS OF ELECTRICAL COILS, INSULATION, LIFTING MAGNETS • REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

A NELSON FIRST

PORTABLE RELAY TEST UNITS FOR PROPER TESTING & MAINTENANCE OF SWITCHGEAR COMPONENTS



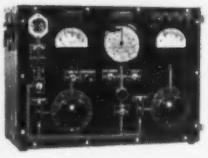
Type RA1-1 Nelson portable test units which may be used in combination for complete testing of switchgear components.

USE NELSON RELAY TEST UNITS TO

- **Improve Operating Performance**
- **Eliminate Excessive "Down-Time" when testing switchgear.**

Up to now a complete rewiring job was necessary to test each different device in a piece of switchgear. Nelson's field service department, working with Nelson's engineering and research departments, has produced a portable relay test unit that will test relays, meters, coils, circuit breakers, etc.

Use Nelson test units to reduce testing time, "down-time" and eliminate much lost production due to present testing methods.



Type RD1-1 Nelson portable test unit for simple testing of meters, protective relays, overload heaters, tripping coils, etc. For use with AC circuits only.

A major source of Electrical Control Equipment for Industry

Write for Bulletin 774

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

CIRCLE 80 ON READER SERVICE CARD

'Life Guard' Hats & Caps

The best in head protection for electrical/construction workers

Jackson's 'Life Guard' safety hats and caps safely resist over 20,000 volts, and they also provide impact resistance to more than satisfy federal requirements for safeguarding construction workers.

'Life Guard' safety caps have narrow brim around sides and back, visor in front. Injection molded plastic is strong yet flexible, has a soft comfortable feel. Caps may be ordered with attached welding helmets, goggles, and assorted face shields.

Standardize on this all-purpose safety hat for maximum head protection. Identify work categories by issuing these different hat colors: white, yellow, grey, and orange.

'Life Guard' safety hats offer neck protection with wide brim all around. The 'Life Guard' headgear is instantly adjustable in hat sizes, and its comfort keeps the hat where it does its job, on the worker's head. Chin straps and warm winterizers are available.

Sold by better welding supply and safety product dealers everywhere

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

31739 Mound Road, Warren, Michigan

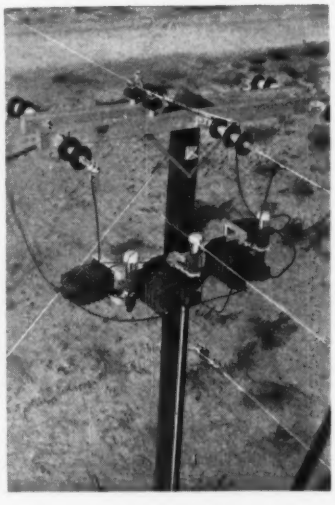
Clean Aluminum

J. J. **HUNT**, Lineman First Class, F. W. **CARPENTER**, Lineman First Class, Ohio Power Co, Portsmouth, Ohio

A special emery belt with compression-connector adapters does a better and faster job of cleaning conductors before a pressure connection is made. The belt is held with hot-stick tools by two linemen who use a back-and-forth motion to clean the conductors.

Formerly a wire brush on a hot-stick tool was used to clean 12, 23, 34.5 and 69-kv conductors before compression connectors were used. But the brush did not always remove the corrosion satisfactorily, particularly in the high corrosion areas near

Cluster Mount



With Emery Belt

factories and coal mines. In place of the brush a No. 70 emery belt 1½ in. wide adapted for use with hot sticks was devised.

Two standard aluminum compression connectors, normally used on 1/0 ACSR to 1/0 stranded wire, are compressed over the emery belt doubled back on itself. A piece of No. 8 copper wire makes the retaining pin. The complete belt took only 30 min. to make.

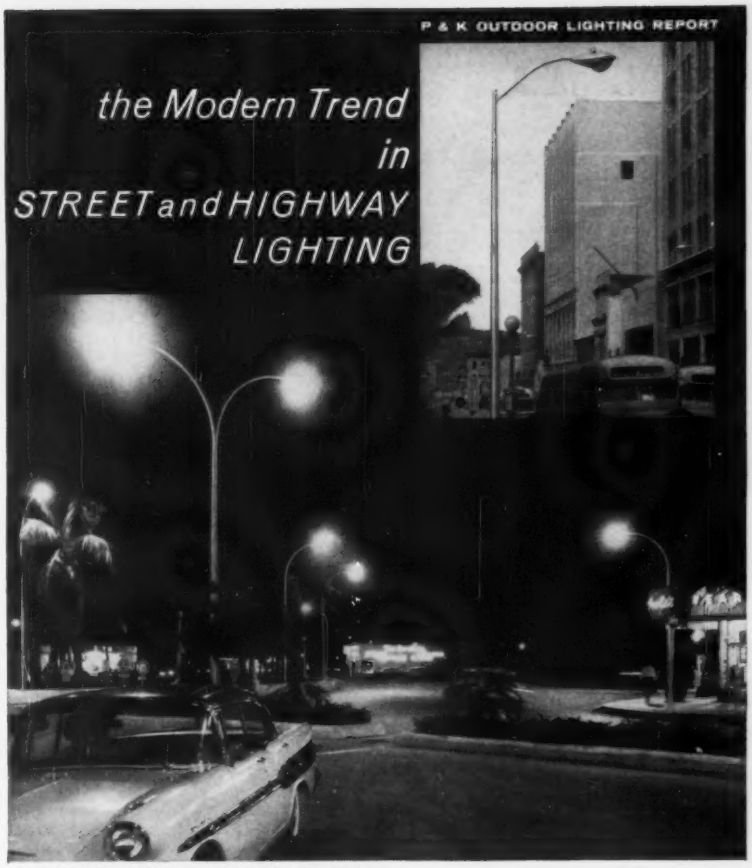
One adapter end has a loop made from No. 6 copper wire. To use the belt, the end without the loop is fastened to a hot-line clamp. Then the emery belt is flipped over the conductor and another hot-stick tool is hooked into the wire loop.

Metering CT's

J. H. WAND, Supt of Metering, Western Division, Texas Electric Service Co, Midland, Texas

Pole-mounted, three-phase metering installations have been simplified on the Texas Electric Service Co system by using preassembled, cluster mountings for the metering transformers. The method saves time in the field, results in a neater installation and eliminates errors in making connections in the field.

Connections can be checked more carefully when assemblies are made up in the shop. Shop assembly also reduces labor costs by about $100 per installation.



TOP PHOTO: New White Way—White Plains, New York
LOWER PHOTO: Traffic circle illumination—West Miami Springs, Florida

P&K ALL ALUMINUM

LIGHTING STANDARDS & DAVITS

More than just modern-looking, P&K street lighting standards are modern in total concept. Compare our use of functional design . . . no scrolls, no tie rods . . . instead a strong aluminum tapered elliptical arm – one piece for minimum inventory, fastest assembly and installation. Compare the P&K davit, truly the ultimate in functional design with a style as fresh as tomorrow. What's more, P&K is modern in the materials of construction: to the inherent strength and light weight of aluminum, P&K has engineered designs to meet every load requirement—from the conventional incandescent and mercury vapor luminaires to the new, larger and heavier models in both mercury vapor and fluorescent. And above all, P&K is modern in its elimination of maintenance problems. No painting required—ever. Even the salty sea air offers no hazard to the good looks of P&K standards.

For more information reserve your copy of the new Aluminum Lighting Standards catalog now. Ask for our helpful brochures ALS and BR-11.

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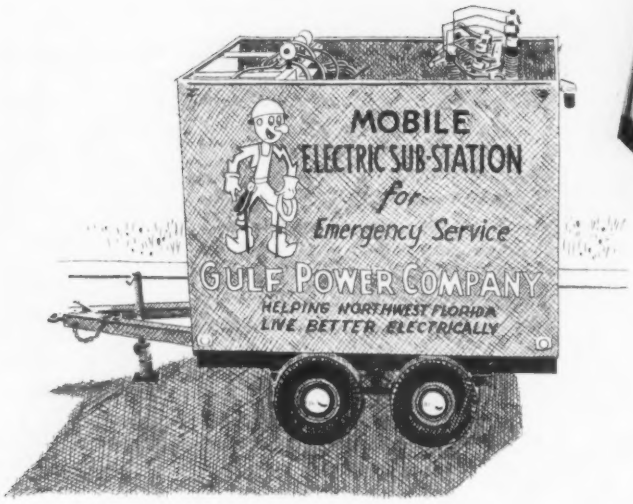
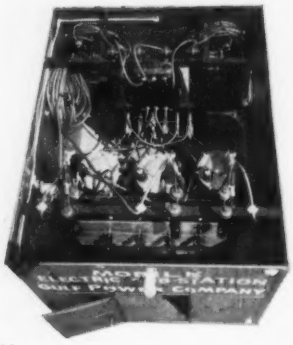




THREE 50-KVA TRANSFORMERS are paralleled with existing banks. Switches operated from outside the trailer are locked open or closed

Mobile Supply Parallels With Single or Three-Phase Banks

JOHN D. HARRIS, District Engineering Dept, Gulf Power Co, Pensacola, Fla.

A mobile transformer bank designed to parallel with any existing single-phase or three-phase transformer bank on the Gulf Power Co system will contribute to greater continuity of service and the minimizing of emergency outages. The mobile unit consists of three 50-kva dual-voltage (7.2/2.4 kv) transformers with four secondary bushings and associated primary and secondary connection boards. This equipment is installed on a 10x18-ft, 6,000-lb capacity trailer.

Secondary connection board

Automatic Units Monitor Load Dispatch Orders

Automatic recording of dispatching orders and instructions provides a means of verifying the content of information exchanged during system disturbances, normal power interchange or routine or emergency switching of lines. The automatic tape-recording equipment is being used by 12 utility systems in the United States and Canada and one in South America. This equipment, the Monitor recorder-reproducer, is made by SoundScriber Corp.

How this equipment can contribute to system operation is illustrated by the installation made by British Columbia Electric Co, Vancouver, B. C. This utility, with over 750 Mw of installed capacity, uses automatic recording as an adjunct to the dispatching of power throughout a 20,000-sq mile area plus the exporting of surplus power to the United States.

In the company's load dispatch office, three Monitors record the heavy communication traffic over telephone and radio 24 hr a day. Two are rack-mounted while the other is used for playback, as a standby spare, or as a portable unit. The recorders are hooked

was designed so that all connections for a single-phase, open-delta, closed delta, or wye secondary could be obtained by changing link positions. The board is made of a 24x42-in. sheet of ½-in pressed asbestos; studs are ¾-in. copper; and bus bars are ¼x2-in. copper. All low-side leads and cable are 4/0 extra flexible 600-v cable. Black laminated engraving stock identifies various connections.

A 400-amp safety switch (nonfusable) is mounted just above the secondary connection board. The switch handle is outside the trailer with provisions for locking in either open or closed position. This switch has proved to be a valuable asset in paralleling this unit with existing facilities.

Primary connection board is ¾-in. marine plywood insulated with cambric varnish. Eight 12-kv bushings with ⅜-in. copper studs are mounted on this board. The design of the primary board was obtained from Arkansas-Missouri Power Co. Primary connections are made by placing copper links on the copper studs.

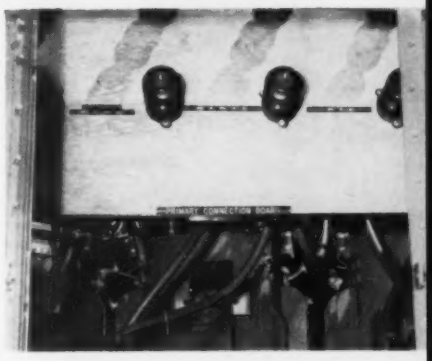
Primary cables are No. 2 15-kv extra flexible cables, which terminate into 100-amp, 15-kv open-type cutouts. Jumpers from these cutouts terminated into a 200-amp, 15-kv oil switch. This switch also is operated from outside the trailer, with provisions for locking closed or open.

The length of both primary and secondary cables is 70 ft, but field use may prove they can be reduced to about 50 ft.

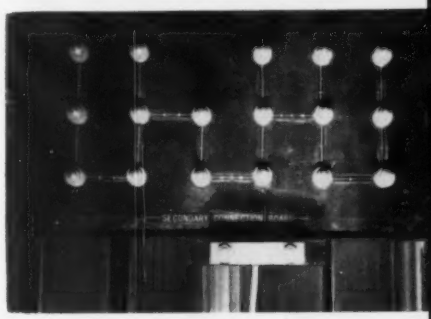
All cables are supported on the pole at the site by riser supports. High-line jumper clamps with threaded ferrules are used to connect secondary risers to the existing secondary; hot-line clamps secure primary cables to existing primary conductors. As the final step in paralleling this unit with existing facilities, a voltmeter is used to test for zero voltage between the safety switch lugs.

The possibility of a 180-deg phase shift is eliminated by the foreman who is instructed to connect the primary leads going to the H_1 and H_2 bushings on the mobile transformers exactly as those on the existing bank.

Cost of the mobile unit was about $5000, including running lights, turn signals and warning lights. The unit can be parked easily and placed in service in about 1 hr by a line crew.



PRIMARY BOARD is connected exactly as existing bank to be replaced to avoid a phase shift



SECONDARY BOARD is connected to single-phase delta or wye secondary by changing link positions

into the load dispatcher's telephone circuit, which in turn is connected to a 60-point board used to handle the load dispatching control function and all supervisory control.

The equipment, weighing only 26 lb and slightly larger than a table radio, operates on 115 v ac and was designed specifically to provide unattended 24-hr service. Recording is done on closely-spaced transverse tracks across the 2-in. wide tape, which moves at 2½ in. a minute. The 300 ft of tape for a 24-hr period fits on 3¾-in. dia spool.

Messages indicating a failure are received over the system's varied communications network and are recorded by the units, which are set for automatic operation. If desired, the equipment can operate with a built-in voice-actuated relay that only records periodic voice transmission. The first spoken syllable triggers the machine and it stops instantly upon completion of transmission.

All two-way talk from the load dispatch office to the field for correcting a failure or redispatching or reallocating loads is recorded. After the trouble has been remedied, the recorded material is played back to compile an accurate and complete report.

In addition, a final report must be filed with the provincial power commission. In all instances, the transverse recording pattern on the tape prevents alteration of the recorded tape without detection.

B. C. Electric spokesmen report the tapes provide them with an accurate time record of all communications. The tape, with numbers 0000 to 1455 printed on it (corresponding to the number of minutes in a day plus a 15-min overlap) furthers the ease of playback on the minute-by-minute taped recordings.

Another installation of the recorder-reproducer is used by the Connecticut Valley Power Exchange for the accurate, 24-hr voice recordings of all load dispatching communications between this regional power pool and participating utilities.

(More Operation on page 128)

ARMY and NAVY Also Use JAQUES Hydraulic EARTH AUGERS

*Pole-setting attachment optional.

ARMY REPORT ON JAQUES KJ-254**

"There was a performance test on Pilot Model (Jaques Earth Auger), Model KJ-254, built by Texoma Enterprises, Inc. This test performed in accordance with Military Specification Mil-A-516B, paragraph 3.9 through 3.9.2.

"This test was performed in sandy, gravelly, red clay, hard and dry to blue silty clay at bottom of hole. Average time per hole for 25 consecutive holes was 78 seconds. Average depth of holes was 67.2 inches. Machine functioned at normal temperature."

***JAQUES newly developed Model TJ-254 is 2½-TIMES FASTER than Model KJ-254!*

Some of 29 JAQUES TJ-254's NAVY bought.

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1. JAQUES Augers have finger-tip, feather-touch controls . . . only 3 primary adjustments for easy, simple operation . . . Mount on standard trucks . . .
2. JAQUES drill holes up to 60" diameter . . . up to 25' deep in toughest soil . . . even in rock . . . FASTER, CHEAPER . . .
3. JAQUES have fewer moving parts for longer life . . . lower maintenance and operation costs . . . less "down time" . . .
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5. FIRST Jaques built 29 years ago is STILL IN OPERATION!

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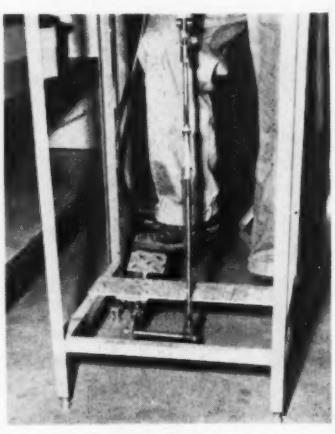
Production line techniques have been applied to the relatively simple job of cementing gaskets to meter covers in Northern States Power Co's new meter shop. Gasket cement is placed in a receptacle which is recessed in a small table top. Operation of a foot pedal raises the ring which is immersed in the gasket cement.

The ring with the adhering gasket cement presses firmly against the meter cover, applying cement to the cover in just the right place and amount. The gasket then is pressed against the cement on the cover. Development of this equipment has speeded the process of cementing gaskets to covers, and has made the job easier and neater.



(More Operation on page 130)

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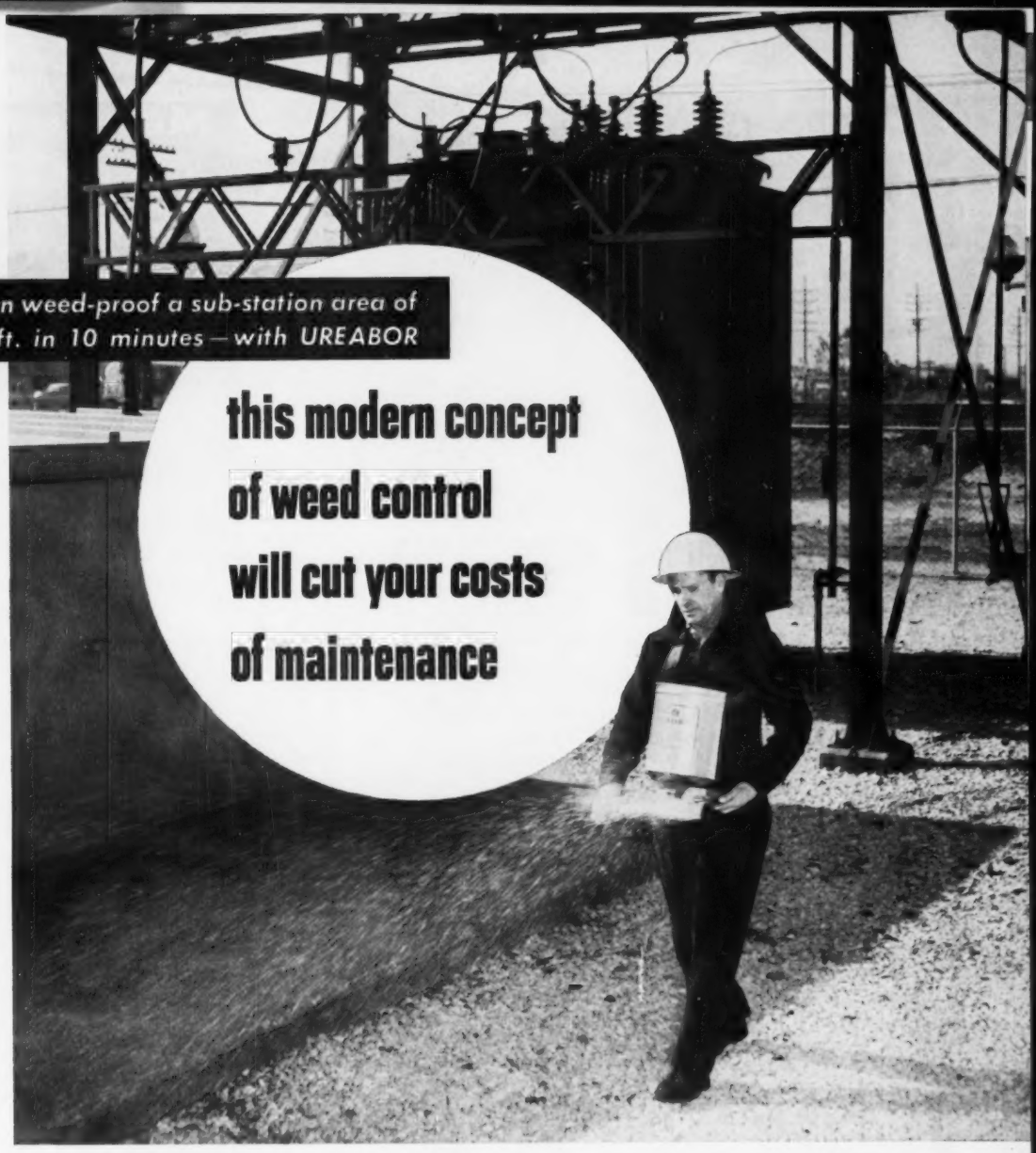

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Overall Length: Approximately 18", with 12" twist, 6" shank
12 Sizes: 9/16" to 1 1/16"

Irwin Adapter Shank fits both hand braces and electric drills

Comes like this with taper square shank for use in hand braces.

Cut off taper square shank. Use in both hand braces and electric drills. No wobble, no run-out.

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Electric Cart Aids Station Operators

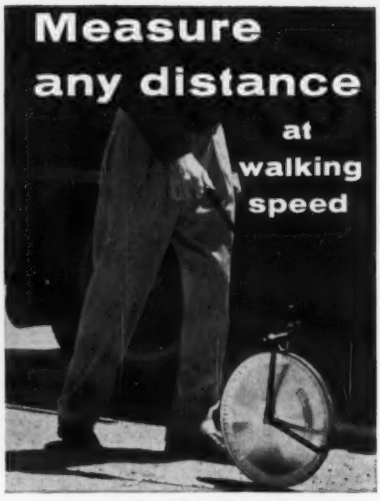
Intake well operators at the Tulsa Plant of Public Service Co of Oklahoma use an all-electric cart to speed them about the property. The battery-operated vehicle can make up to 35 miles on one charge.

Intake well operators who range over the plant's 40 acres have found that the cart is economical to operate and requires almost no maintenance. A special charger converts 110 v ac to 24 v dc for the cart's batteries.

Sheath Covers Shaver Blade

GEORGE G. HARTMAN
WILBUR SALGAT, Overhead Lines Dept, Detroit Edison Co, Detroit, Michigan

A leather sheath covers the blade of the pole shaving tool on Detroit Edison Co trucks. The metal guards used in the past had a tendency to fall off and get lost, creating a hazard. The sheath reduces the chances of cuts and damage to equipment and injuries to men.



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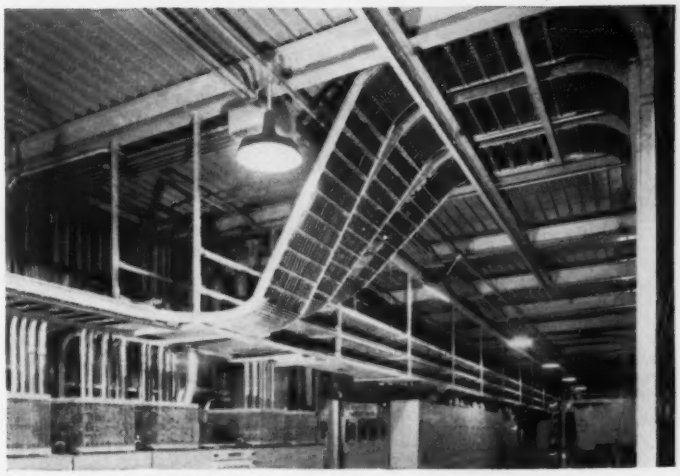
how INLAND STEEL uses GLOBE INTERCHANGEABLE TRAYS to support cables in their Indiana Harbor Plant



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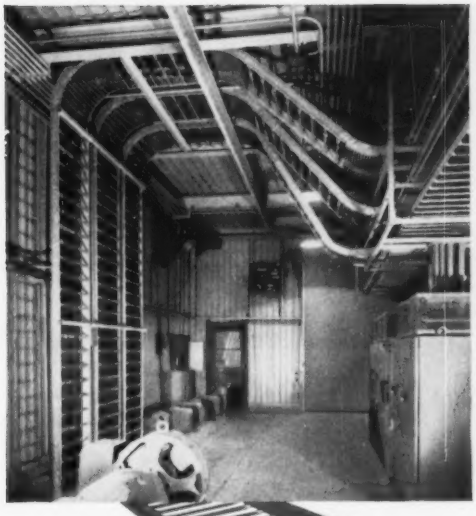

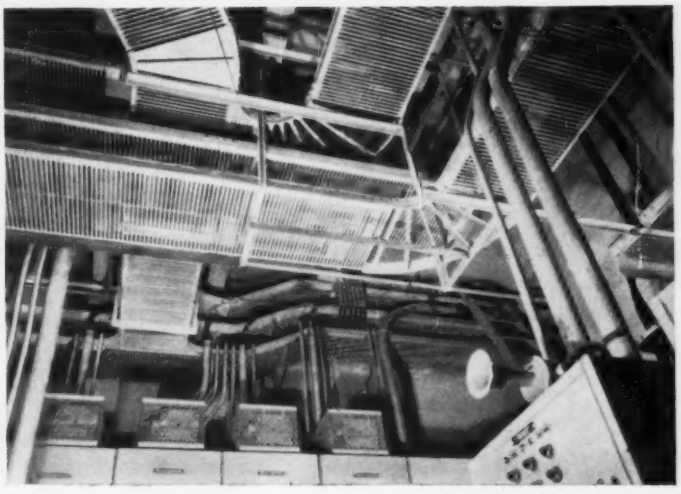

Globe's two types of cable trays, one a ladder type and the other a basket type, to support cables, wiring and tubing have become increasingly popular because they can be used INTERCHANGEABLY at any given location depending on the type and weight of the cables to be suspended. The advantages of each type tray can be used to the fullest. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is used for the support of communication wire, instrument tubing and control cables in automation applications.

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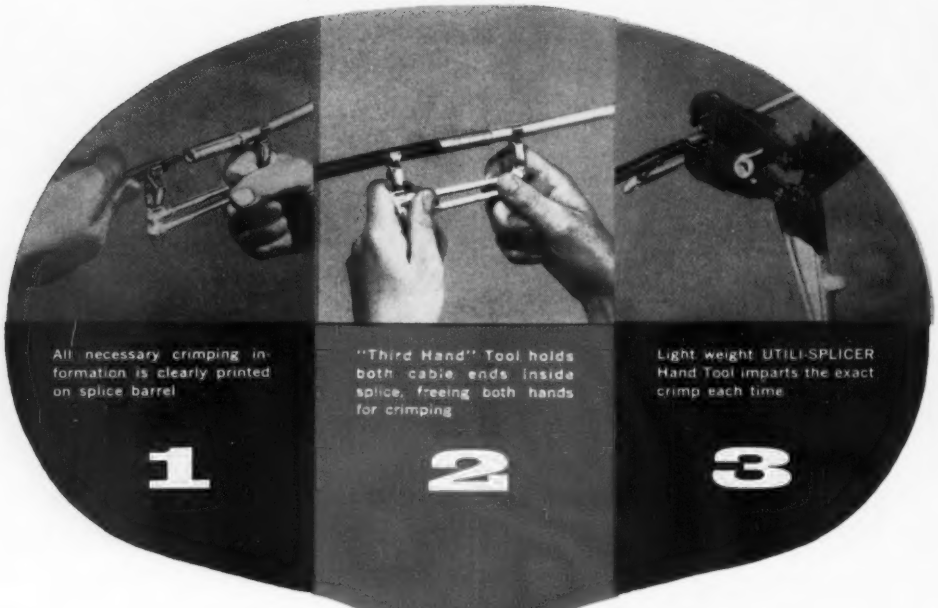
All necessary crimping information is clearly printed on splice barrel
1
"Third Hand" Tool holds both cable ends inside splice, freeing both hands for crimping
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Light weight UTILI-SPLICER Hand Tool imparts the exact crimp each time
3

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Now, the AMP Step-Down UTILI-SPLICE, combined with the new light weight crimping tool and the "Third Hand" Tool, give you still greater economies in your step down splices, savings in man-hours plus AMP's reliable attachment method. For all stranded, solid or ACSR conductor combinations in copper and/or aluminum . . . wire size range #8 through #1/0 AWG.

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Sheet Neoprene Waterproofs Scroll Case

Lining of the walls of a scroll case with sheet neoprene stopped the leakage of water into the powerhouse of Skelton Station of Central Maine Power Co. Based on experience with neoprene linings in similar installations, the company expects there will be no need for maintenance on this latest installation.

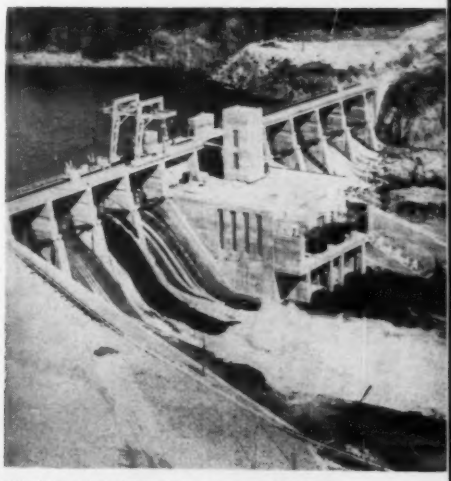
The scroll case at the 16,000-kw Skelton Station originally had an asphaltic waterproofing compound applied to its concrete walls. This compound gradually had hardened, cracked, and flaked off, exposing the joints in the concrete. Water under about a 75-ft head forced its way through the joints and onto the floor of the powerhouse, creating a maintenance problem as well as a safety hazard to operators and electrical equipment.

Recalling that similar leakage problems had been solved by lining concrete scroll cases with sheet neoprene, Central Maine Power personnel decided to apply this solution at Skelton Station. The lining was applied when the scroll case was unwatered during a shutdown for regular maintenance work.

The lining was applied from just beyond the expansion joint between the scroll case and penstock and extended all the way to the bullnose. In this distance the scroll case diminished in diameter from 17 ft to 6 ft and describes a 360-deg turn.

In applying the sheets, a cold bond process was used to attach the 1/16-in. thick sheets of cured neoprene to the concrete. Each seam was lapped and sealed, after which the entire lining was given a top brush coating of light grey neoprene. The brush coating will provide a more light-reflective surface to make it easier for maintenance crews to see the lining and seams during periodic inspections. The lining was applied by Technical Coatings, Inc, with material supplied by Gates Engineering Co.

The same waterproofing system had been used since 1955 by Central Maine Power in six other similar installations. An eighth lining was added last year when the second scroll case at Skelton Station was neoprene lined. Yearly inspections have shown no need for maintenance of any of these linings. To date there has been no indication of any marine growth on the neoprene or of any surface deposits that cannot be easily wiped off.



SKELTON STATION is rated 16,000 kw with a 75-ft operating head. Two scroll cases at the station have been lined with neoprene sheets

NEOPRENE LINING extends all the way to the bullnose in a scroll case that drops in diameter from 17 ft to 6 ft and describes a 360-deg turn

CIRCLE 133 ON READER SERVICE CARD

TOWERS

by

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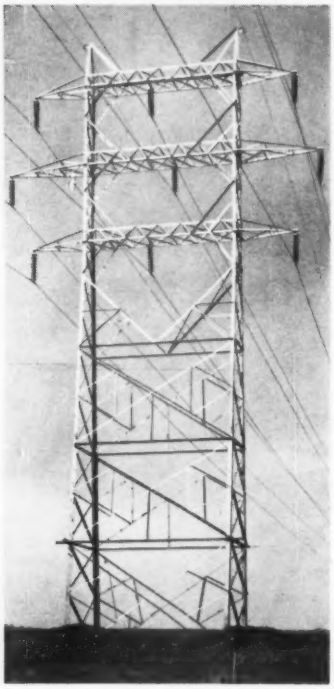

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In-Plant Welding Repairs Large Boiler Drums

G. E. LIEN, Section Head, Piping and Metallurgy, American Electric Power Service Corp, N. Y.

G. E. BRIERS, Plant Engineer, Cabin Creek Plant, Appalachian Power Co, Cabin Creek, W. Va.

Careful application of methods of detection, welding, inspection and stress-relieving paid off in the successful repair of two 450,000-lb/hr boiler drums, believed to be the largest drum welding job attempted in the field. Experience gained on this job at Cabin Creek plant enabled maintenance crews to save almost $38,000 on a similar job done on a second pair of boiler drums.

The repair was made on a very heavy weld between the 4-in. drum head and the 6-in. thick, 25-in. OD sleeve that forms the manhole opening, plus other welds, in the drums for boilers No. 81 and 82 at Cabin Creek. It was in an inside weld at the sleeve on the north end of boiler No. 82 drum that a small crack was first found. Inspection using the Magnaflux particle method showed a similar crack in boiler No. 81 drum, north end, plus cracks in several small drum-connection welds.

Complete Void Found

Subsequent grinding, drilling and chipping indicated a complete void between the weld made from the outside of the drum and the weld from the inside. This void resulted from the method of weld preparation used when the drum was fabricated.

Incomplete fusion was found in the critical root area, making it mandatory to probe deeper into the other drum welds. It also was apparent that a proper repair could be made only by removing and replacing the entire ring using a procedure that would insure a sound weld completely through the joint.

The subsurface inspection was made of the south ends of both

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Now Nylon Klein-Kord safety straps are the newest Klein development offering maximum safety with maximum flexibility. These are the only nylon straps designed to meet the tests given in Edison Electric Institute Report AP-2.

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drums with an ultrasonic reflectoscope. Although this method was only partly effective, due to the odd shape of the weld, it did show enough of a pattern to question the welds.

To probe for subsurface inspection, a licensed X-ray technician performed a gamma-ray inspection using a 3-curie source of cobalt 60. He also supervised safety precautions to protect plant personnel. Films required a 3-hr exposure to penetrate the odd contours of the 7-in. wall along the sleeve. Radiographic films showed voids or lack of fusion all the way around the welds and confirmed the need for removing the sleeves from the south ends of both drums also.

Prepare for Welding

After the sleeves were removed using arc-air cutting torches, the drum end was cut back or built up to the approximate welding bevel contour. During this operation several laminations in the drum plate were ground down and repaired by welding. The final bevel was machined with a portable boring bar. Each sleeve was positioned by temporary welded supports and joint surfaces were heated to 300F prior to welding.

Four 10-in. long segments of weld were deposited on the circumference of the joint, with one segment being welded from the inside while another segment diametrically opposite was welded on the outside. Thus, two welders could work together and temperature stresses could be minimized. The root of the weld made from one side was removed to sound metal before starting to weld from the other side.

The remainder of the groove was filled and the heavy fillet was made with one welder on the inside of the drum and another on the outside. By working on only one end of a drum at a time, it was possible to use a ventilating fan at the other end to blow cool air in toward the welder, a necessity because of the preheat temperature.

Prior to welding, all surfaces

(*Continued on page* 137)

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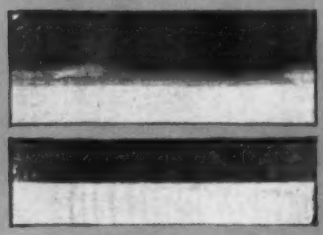

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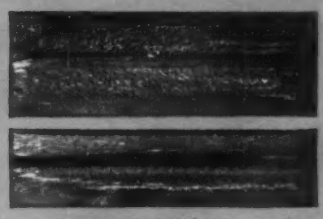
COMPARE

any other clamp with Weaver. Rough wire-bearing surfaces invite trouble!



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Garfield 1-6336

In-Plant Welding

(*Continued from page* 135)

were Magnafluxed for cracks. Throughout the welding each additional ½ in. of deposited metal was checked before proceeding. This inspection was made while the welding preheat temperature was maintained. After welding was completed, it was possible to drop the preheat temperature while the joint was gamma-ray inspected and preparations were being made for stress relieving.

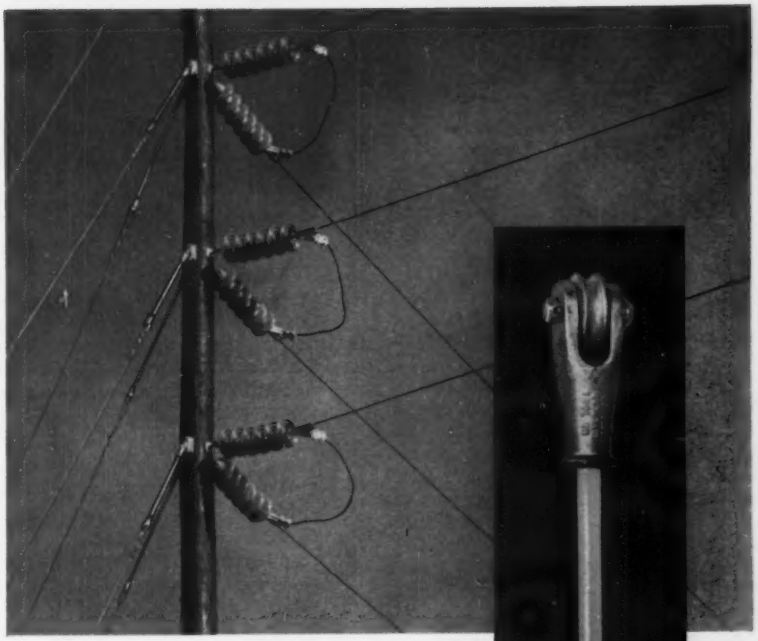
Fillet welds were ground smooth prior to the final gamma-ray inspection. This was necessary because grooves between the weld heads appeared as lines on inspection films and looked like cracks. After additional grinding, another set of films gave a clear reading, approving the weld as sound.

Stress Relieving Speeded

Stress-relieving required bringing the complete end of the drum up to temperature. This involved building a fire brick wall inside the drum 5 ft in from the end. Specially-built gas burner rings inside and outside heated the complete drum end to 900F. This temperature was held for 70 hr, followed by a period of controlled cooling. Average total time for each heat treatment was 159 hr. Considerable care was needed to provide the proper gas and air mixture to the burners.

Water-cooled tubes and temperature shields were placed next to the drum support bolts to avoid overheating and stretching them. This method of cooling was so succesful that it was possible to raise the stress-relieving temperature to 950F on the second pair of boiler drums. The higher temperature cut the holding time in half and the total heat treatment time to 67 hr.

Cabin Creek personnel put in 13,800 man-hr and the construction contractor 5,000 man-hr on this repair job. Added to this was the time of boiler company supervisors, inspection technicians and the boiler inspector who discovered the crack and gave final approval on the repairs. About 4,000 lb of electrodes were used.



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MOTOR CONTROLS . . . "Quick Selector" charts for magnetic and manual starters; descriptive copy and design data, stocking information, and ordering instructions. Products include manual starters, new Design Size 0 to 1¾ nonreversing and reversing starters, Little Giant controls and new Size 5 and 6 magnetic starters and contactors. Catalog 5900, 70 pages. Furnas Electric Co, 1026 McKee St, Batavia, Ill. **(22)**

DISTRIBUTION

CIRCUIT BREAKERS . . . molded case, low-voltage power, both standard and engineered products are described. Selection charts on breakers; outline sketches and listing of components and ratings for 16 types of Transfo-Unit combinations. 1960 Speedfax Catalog, 60 pages. I-T-E Circuit Breaker Co, 1900 Hamilton St, Philadelphia 30, Pa. **(23)**

POWER CENTERS . . . 3-phase, liquid-filled; Type OLC—oil-immersed; Type ALC—askarel immersed. Basic units and terminal related equipment are covered to permit choice of standardized arrangements for specific requirements. Also includes data on design and construction, standard and special testing, standard and special accessories. Brochure, 20 pages. R. E. Uptegraff Mfg Co, Scottdale, Pa. **(24)**

STEEL CONDUIT . . . and steel electrical metallic tubing. Ready reference for ordering and installation provided through tables. N.E.C. material. General background information included. Handbook, 32 pages. NEMA, 155 E 44 St, New York 17, N. Y. **(25)**

VOLTAGE REGULATOR . . . new JFR line, up to 33% smaller in height and weight. Describes 23 features of distribution regulator, plus specifications and vari-amp ratings available. Bulletin 21B-7977E, 16 pages. Allis-Chalmers Mfg Co, Milwaukee 1, Wis. **(26)**

INSTRUMENTS

INSTRUMENTS . . . for application at the generating plant, substation, load dispatcher's office, distribution area and testing locations. Photographs and listings in the descriptive bulletin and apparatus handbook section. Bulletin GEZ-2975, 12 pages. General Electric Co, Schenectady 5, N. Y. **(27)**

RECORDERS . . . and recording control stations which continuously indicate and record the standard 4-20 ma dc output of any ElectriK Tel-O-Set transmitter or transducer. Controller specifications, dimensions, and features are included. Specification FS-301-8, 6 pages. Minneapolis-Honeywell Regulator Co, Industrial Div, Fall River, Mass. **(28)**

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INSULATING MATERIALS . . . for repair and maintenance of motors, generators, and electrical or electronic equipment. Illustrations of products and applications, with price information. Ordering data for repair and maintenance shops covers such standard items as varnished or saturated tubing and sleeving, laminates and high-temperature insulation. Catalog 34, 36 pages. Insulation Mfg Corp, Publications Dept, 565 W Washington Blvd, Chicago 6, Ill. **(29)**

MAINTENANCE

ANTI-CORROSIVE PAINTS . . . Capox, catalyzed epoxy-resin coatings to combat corrosion under adverse moisture and chemical conditions; Aerox, for airway markings; Surfa-Prep No. 100, combines pretreatment and primes new galvanizing in one operation; and Galvanox-Type II (epoxy), a new chemically resistant zinc-rich coating. Technical Bulletins No. 1, 2, 3, and 4, each 2 pages. Subox, Inc, Fairmount Plant, Hackensack, N.J. **(30)**

SOLDERING IRONS . . . light weight, calorized and ironclad tips; tubular heater. Case histories and table to aid selection. Publication GED-3553, 8 pages. General Electric Co, Schenectady 5, N. Y. **(31)**

TURRET DERRICK . . . aerial lift, universal derrick, and a digger are three components of the Truco turret derrick. Specifications for three models, general information, charts. Booklet, 16 pages. Truck Equipment Co, 3963 Walnut St, Denver 5, Colo. **(32)**

SAFETY

FIRE-FIGHTING EQUIPMENT . . . for interior use. Globe automatic sprinkler systems, C-O-Two high and low-pressure carbon dioxide systems, smoke detection systems, dry chemical systems, foam systems, and others. Details on styles of standard and custom-built cabinets available, cabinet finishes, door choices, hardware. Catalog, Form S-62, 28 pages. The Fyr-Fyter Co, Customer Services Dept, 221 Crane St, Dayton 1, Ohio. **(33)**

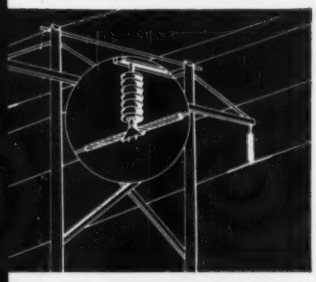
SAFETY MARKINGS . . . self-sticking signs to identify and protect equipment and eliminate need for instruction at each point of operation. Conform with standards of NEMA, ASA and others. Catalog 520, 28 pages, plus free samples. W. H. Brady Co, Dept MS, 727 W Glendale Ave, Milwaukee 9, Wis. **(34)**

*Superformed** means better

ACCURACY • UNIFORMITY • GRIPPING

...*for* overhead line CONSTRUCTION, PROTECTION, REPAIRS

SUPERFORMING is an exclusive patented process for helical wire forming . . . *developed* by Fanner, the earliest commercial manufacturer of machine-formed armor rods . . . *formed* by special Fanner-designed machines with unequalled accuracy, freedom from surface damage or cross-sectional distortion . . . *tested* with specially-devised equipment simulating most severe operating conditions . . . *backed* by an organization which has built on Integrity, Service and Quality . . . *SAVES MONEY* because application is fast, simple, requires no tools . . . reduces maintenance . . . extends service life of conductors. That's why *more and more utilities are using more and more Superformed Products.* A-1429A

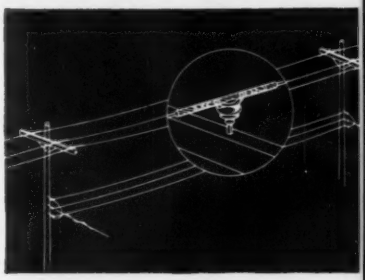


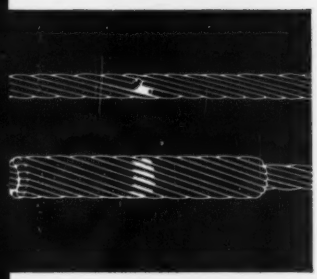
◀ ARMOR RODS

Protect against wind-induced and resonant-frequency conductor vibration at supporting points.

LINEGUARDS ▶

Protect at support points (and taps) in urban distribution where short spans are common; smaller wire sizes and shorter length than Armor Rods.



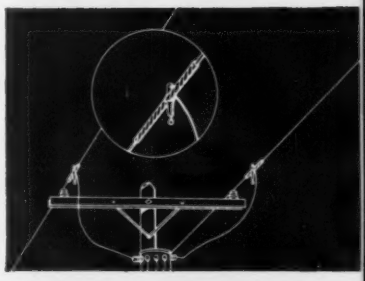


◀ PATCHRODS

Repair damaged or broken (up to 25% of strands) conductors, too far from support for Armor Rod to protect.

TAP ARMOR ▶

Protects where taps are required beyond extremities of Armor Rods on long spans or un-armored conductors.

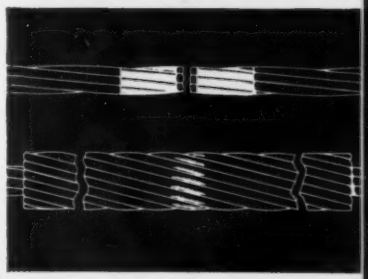


◀ FANNGRIPS

Provide ideal dead-ending and splices for wires, strands or cables for: Guys, Conductors, Multiplex Cables, Come Alongs, similar uses.

FANNSPLICES ▶

Join two ends of wire, or restore damaged conductors to original strength.



PLASTIC PRODUCTS FOR CONDUCTOR PROTECTION

Kover-Gard Ground Wire Moldings . . . Plastic Fannguards . . . Rigid and flexible Insulating Tubings. For field or factory application, wherever there is a real need for surface covering.

STOCKS . . . SERVICE

Fanner Superforms are sold and serviced nationally by 22 Manufacturers' Agents in 34 locations. Stocked by electrical distributors from coast to coast.

PACKAGING

Superformed Products go to you in pre-packaged sets . . . the correct number of rods, centermarked with identification. Also supplied in bulk.

*Trademark

Fine Fanner Superformed Products

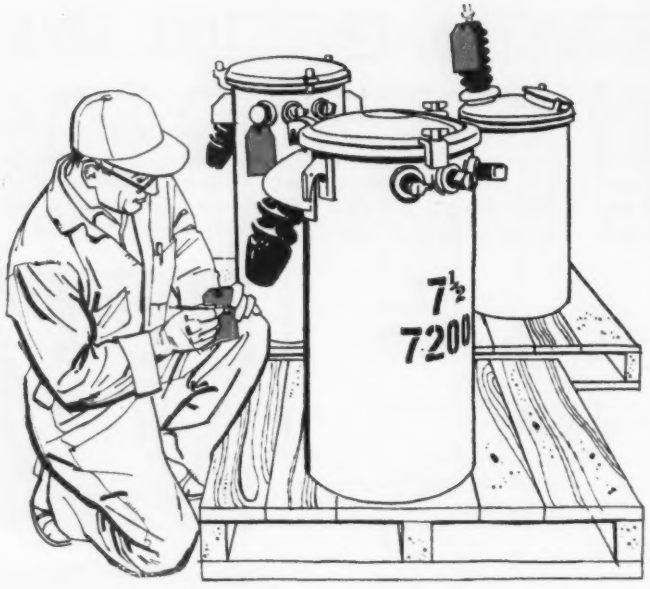
THE FANNER MANUFACTURING CO.
Brookside Park • Cleveland 9, Ohio
Electrical Products Division

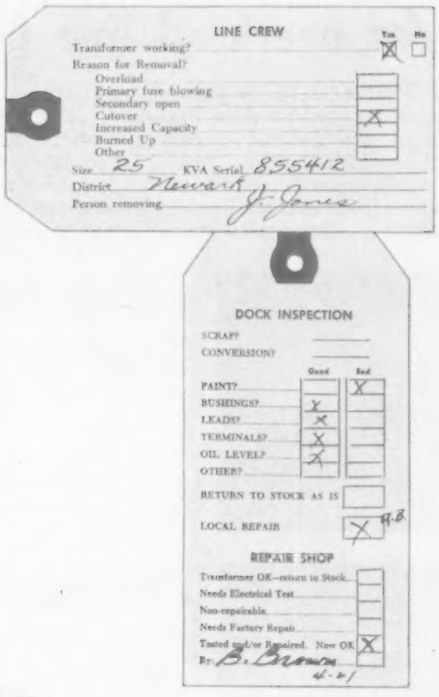
Licensed for use under or made in accordance with one or more of the following patents: Patent No. 2,587,521, 2,769,478, 2,588,663—Other patents pending.

APPLICATION DATA

Specification and ordering are made easy by Fanner Superformed Products Catalog EP-8. Contains 48 pages of Selection, Application, Installation information.

CIRCLE 139 ON READER SERVICE CARD





Local Inspection and Tag Cut Transformer Handling

H. F. MILLER, General Supervisor, Ohio Power Co, Newark, Ohio

A new method of handling transformers removed from service and sent to division stores has as its foundation a simple control tag. Through use of this method:

1. Transformers handled through the division repair shop have been reduced by at least 50%.

2. Repair crews do not have to handle transformers of a size or type no longer required, or in need of factory repair.

3. Hauling of transformers from the districts to the division repair shop has dropped by at least 50%.

4. Storeroom personnel do not have to move transformers into and out of the repair shop needlessly.

5. Handling by storeroom personnel of transformers to be reused in the districts is eliminated.

6. Inventory of transformers is materially reduced.

This method of handling has been in effect for about one year and no serious difficulties have been encountered. Considerable handling already has been saved. On three separate occasions totaling 230 transformers, 122 of them did not have to be handled by repair and test crews. None of the transformers that circumvented the shop has had to be returned. This method is being used in Newark and Portsmouth Districts and has now been adopted by Central Division.

Formerly, transformers removed in Newark District, and sent in from all other districts, were unloaded and stored until the repair shop could handle them. Included were transformers which had been working when removed, those removed because of burn-up, and others for factory repair, conversion or scrap. With no way to classify the transformers, each one went through the shop for testing.

To eliminate this unnecessary handling, the new method was developed through the cooperation of the Substation Dept, which handles testing; the Distribution Dept, which removes the transformers; the division staff; and the Stores Dept, responsible for handling. The method involves an inspection of removed transformers at the district stores dock. The control tag is the heart of the method.

This cardboard tag, similar to a shipping tag, has one side marked "Line Crew" which is used by the crew when the transformer is removed. This side tells the size, serial number, reason for removal, district, person removing, and whether the transformer was working when removed. Each transformer is placed on the dock as before with the tag attached.

The reverse of the tag has a

(*Continued on page* 142)

more oomph

Like some people, some derricks have a little extra oomph. This derrick—Holan's Series 6800 has it . . . especially in the lower operating ranges.

The 6800 has extra strength because of extra lift cylinders—four instead of two. It lifts 2,000 pounds when only 5½ feet from the ground . . . body-loads 4,000 pounds. Capacity is 8,000 pounds.

More digger oomph, too

The digger here is Holan's 3-speed Series 5400. Maximum torque is 8,400 foot-pounds—tops by far among derrick-suspended diggers. With the power of the derrick and digger combined, you could bore through just about anything.

If you are in the market for power equipment with that extra oomph, get in touch with a Holan Field Representative.

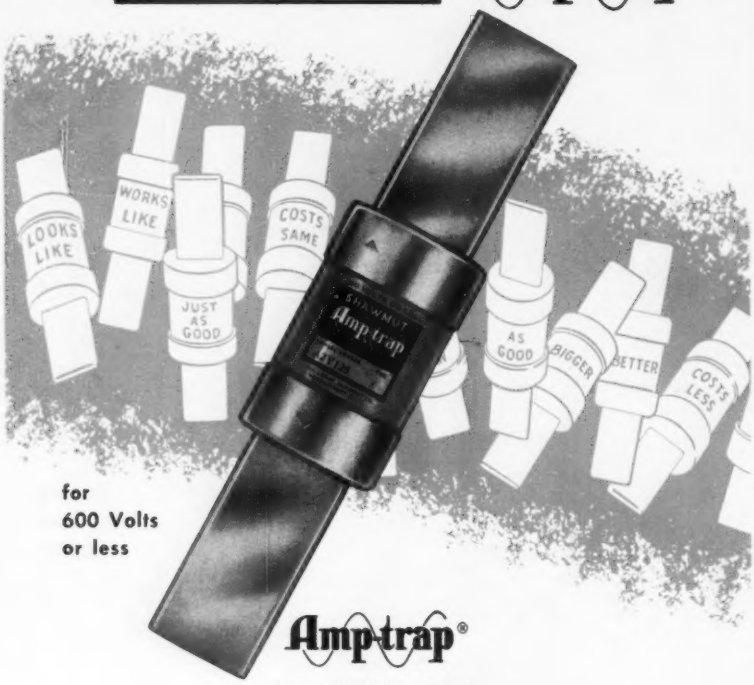
Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

HOW GOOD IS... AN IMITATION Amp-trap®?



for 600 Volts or less

Amp-trap®

VS IMITATIONS

Amp-traps are *our* products. We originated and developed them. We alone manufacture them. They are so good that others are now imitating them. This is flattering because it indicates Amp-trap is superior. But, don't be confused by imitations.

Amp-trap®

VS SUBSTITUTES

"Just like Amp-trap." "As good as Amp-trap." "Works like Amp-trap." "Better than Amp-trap." These are the deceptive phrases that imitators must use. Without them they can neither explain nor sell their substitutes.

NOTHING TAKES THE PLACE OF

Amp-trap®

Whenever you *need* Amp-trap, you *want* Amp-trap — not an imitation or a substitute. Amp-trap is a very special current limiting device with high interrupting capacity. Regardless of claims, imitations aren't enough. More than 27 patents prove it. *Nothing takes the place of Amp-trap!* For your own protection specify Amp-trap. Then — make sure you get it.

Amp-trap® – Always At The Switch

REGISTERED UNITED STATES PATENT OFFICE Est. 1893

THE CHASE-SHAWMUT CO.

374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Subsidiary of I-T-E CIRCUIT BREAKER CO.

Amp-trap® Tri-onic® t-d C-O-T® TRIONIC® ONE-TIME C-O-T

Control Tag

(*Continued from page* 140)

space for "Dock Inspection" and "Repair Shop". The dock inspection is made in the districts by the local stores personnel, who mark the tag "scrap" or "conversion" depending on the size and type of transformer. If neither category applies, a detailed inspection is made and the tag is checked either "good" or "bad" for paint condition, bushings, terminals, leads, oil level, and other.

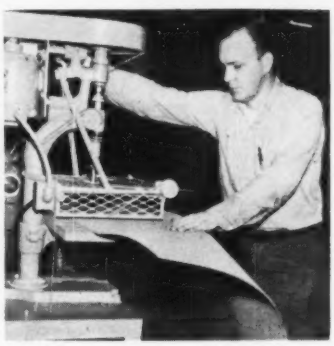
If all items are "good" and the transformer was working when removed, a block is checked

Weight Speeds

JOHN G. HANLEY, Stores Dept, Detroit Edison Co, Detroit, Mich.

Detroit Edison Co is using a 10-lb weight with a hook to hold down the disconnect lever, temporarily, when unhooking pole-hauling trailers. Drivers of pole-hauling trucks, who work alone, can make deliveries faster and easier with this method where no help is available. Previously it was necessary for the driver to find some way to brace the lever in the disconnect position.

Drill Press Eases

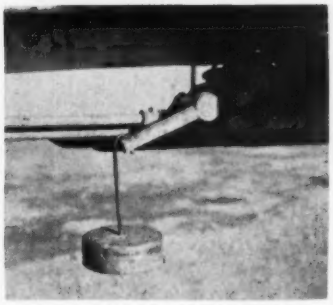


Stocking of a variety of gaskets became such a problem that Oklahoma Gas & Electric Co's shop staff set up a simple scheme to solve it. The difficulty was that no matter how many

showing "return to stock as is." If any item is checked "bad" or the line crews' reason for removal indicates testing or repair, the tag is marked for "Local Repair." Stores personnel remove all transformers marked for scrap, conversion or return to stock.

The Repair Shop section of the tag is next used by the repair and test crews. Spaces are provided for indicating whether the transformer can be used, needs further testing, is not repairable, or should be sent to the factory. After the repair and test crews indicate the disposition, stores personnel again sort the transformers into correct categories.

Unhooking of Trailer



Stocking of Gaskets

sizes of gaskets and combinations of inside and outside diameters were kept in stock, the one required never seemed to be available. Frequently it was necessary to improvise.

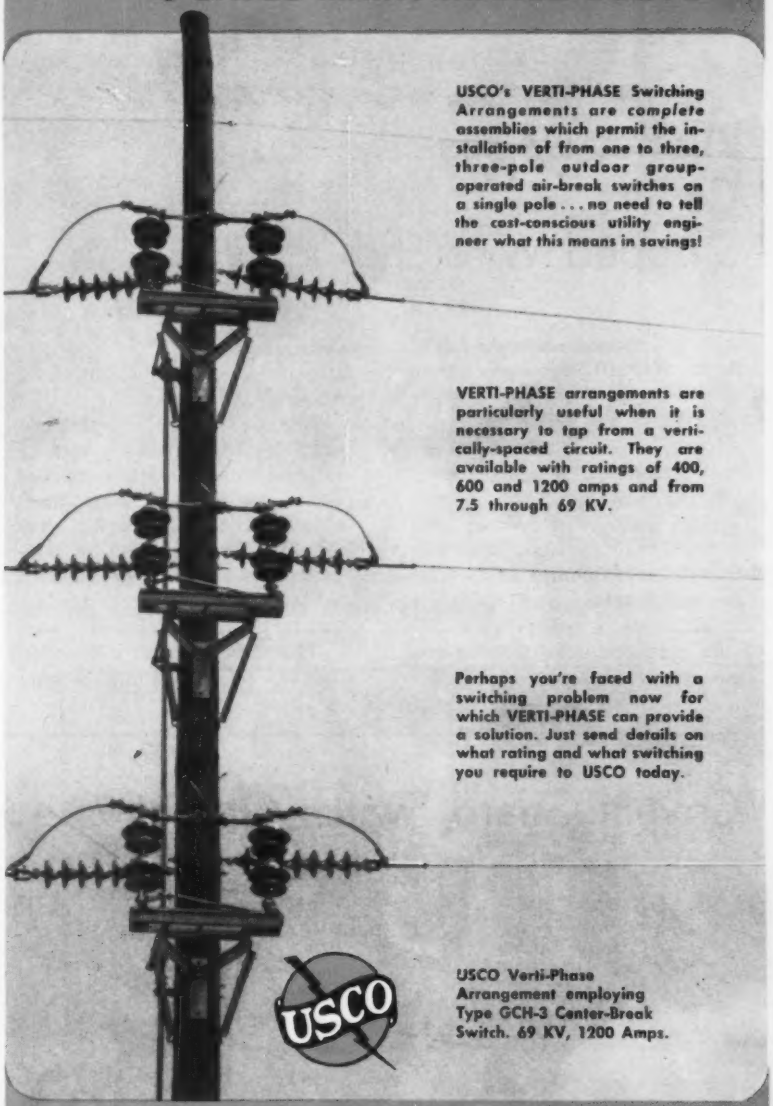
To solve the problem, a drill press was set up to cut the gaskets. It cuts gaskets from sheet material quickly, neatly and easily. It was set for slow speed, 200 rpm. Instead of a bit in the drill press there are two cutting knives, which can be adjusted to cut at the desired inside and outside diameters. It takes only a minute to cut any size of gasket.

The shop has been able to eliminate the wide variety of gasket sizes that were kept in stock.

ECONOMICAL!
EFFICIENT!

USCO VERTI-PHASE SWITCHING

- SAVES COSTLY GROUND SPACE
- SAVES MATERIALS AND LABOR
- SAVES MAINTENANCE COSTS



USCO's VERTI-PHASE Switching Arrangements are *complete* assemblies which permit the installation of from one to three, three-pole outdoor group-operated air-break switches on a single pole . . . no need to tell the cost-conscious utility engineer what this means in savings!

VERTI-PHASE arrangements are particularly useful when it is necessary to tap from a vertically-spaced circuit. They are available with ratings of 400, 600 and 1200 amps and from 7.5 through 69 KV.

Perhaps you're faced with a switching problem now for which VERTI-PHASE can provide a solution. Just send details on what rating and what switching you require to USCO today.

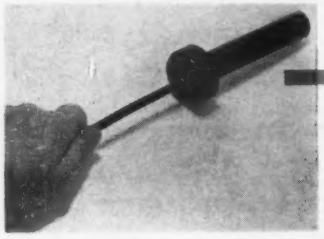
USCO Verti-Phase Arrangement employing Type GCH-3 Center-Break Switch. 69 KV, 1200 Amps.

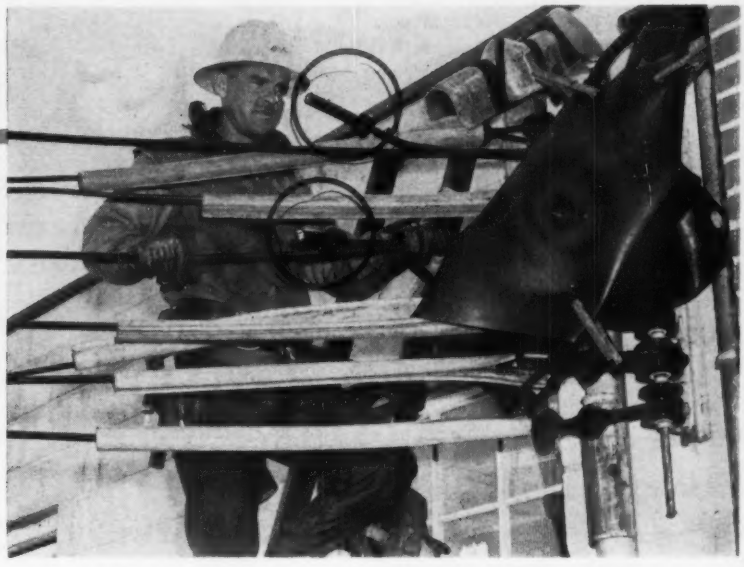
USCO Power Equipment Corp.

829 North 36th Way, Birmingham 4, Alabama • LYric 2-7241

Designers and Manufacturers of High Quality High Voltage Equipment

CIRCLE 143 ON READER SERVICE CARD 143





Rubber Device Covers Stripped Wire End

A. D. SCHMIDT, Engineer, Electric Distribution Dept, Baltimore Gas & Electric Co, Baltimore, Md.

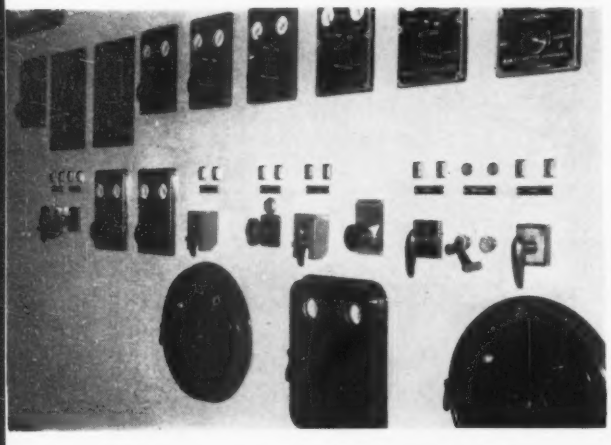
A reusable "wire-end-cover" affords protection to linemen against inadvertent contact with exposed wire ends and facilitates moving and manipulating conductors in close quarters when making taps or splices. This device has been developed by engineers of Baltimore Gas and Electric Co working with Line Material Industries.

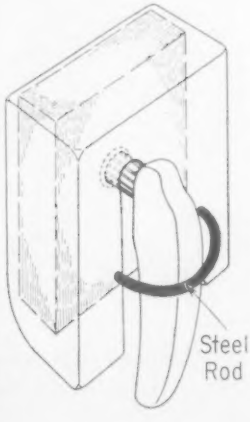
The need for a convenient and quick means of covering ends of skinned energized conductors has been apparent for some time. Periodic feeder trip-outs and electric flash accidents due to inadvertent contacts with unprotected wire ends of energized conductors emphasized this need.

The wire-end-cover is designed for use on conductors ranging from No. 4 to 4/0 AWG, inclusive. It also is designed to retain its grip on the conductor regardless of position. Laboratory tests show an average leakage current of 1.5 milliamp at 12 kv. The wire-end-covers are suitable for use only on conductors energized at or below 4 kv primary voltage. The device currently is undergoing field trials.

CIRCLE 144 ON READER SERVICE CARD

Covers Guard Switch Operation





W. E. PENNINGTON, Supt, Pineville Generating Station, Kentucky Utilities Co, Pineville, Ky.

The accidental operation of switches in power stations can be prevented through use of a simple and inexpensive lock cover. This safety device is used on all power station control switches in the Pineville Generating Station of Kentucky Utilities Co.

The lock cover, designed to slip over the switch handle, is made of $\frac{1}{16}$-in. sheet steel. A curved steel rod prevents rotation of the switch through inadvertent contact or by error. Cost of the safety cover was $2.50.

(More Safety on page 147)

FARGO DEPENDABILITY . . . IN A CABLE SPREADER

Fargo introduces the "S-1" cable spreader using wet process porcelain and designs familiar for years to the electric utility industry. The "S-1" with known long term dielectric and mechanical strength sets a new yardstick for dependability.

FARGO "S-1"

it's porcelain

1. Proved long term weather resistance.
2. Proved long term dielectric strength.
3. No bothersome grommets.
4. Easy, fast installation.
5. Positive mechanical gripping of neutral assures spacing in span.
6. Swivel action of neutral clamp ideal for grade or corner construction.
7. Inherent weight dampens cable vibration.
8. Supports weights over 1500 lbs.
9. "V" groove design covers all cable sizes from ½" to 1½".
10. Mechanically capable of withstanding forces generated by faults in excess of 10,000 amperes.
11. Six inch on center spacing suitable for 5 or 15 KV construction.

Ask your line Material Field Engineer for complete details.

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LINE MATERIAL INDUSTRIES
McGraw-Edison Company
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Manufactured by
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FARGO

Upgrade relay test methods

MANUFACTURED IN ACCORDANCE WITH, OR FOR USE UNDER U.S. PATENT #2,735,979

Reduce "set-up" time for relay testing to minutes with portable . . .

Send for detailed literature

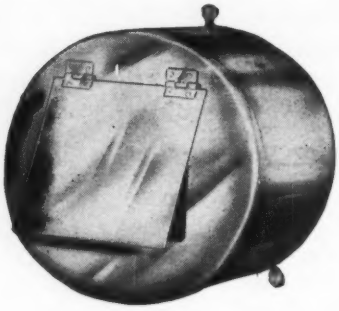
Multi-Amp Cat. No. JR-4. Multi-Amp eliminates sprawling test apparatus, confines instrumentation to a single enclosure for quick and efficient testing of relays. Test unit is a continuously adjustable current or voltage source. Complete metering and timing instruments to monitor output. Several Multi-Amp models to meet all relay testing requirements.

Multi-Amp insures **continuous power for continuous production.** Saves man-hours, eliminates involved circuitry, speeds "set-up" time. Features complete portability, ease of use, safety. Standard models from 0.1 to 100 KVA for most applications; custom-engineered units as required.

MULTI-AMP Division
MULTI-AMP ELECTRONIC CORPORATION
465 LEHIGH AVENUE UNION, NEW JERSEY

CIRCLE 87 ON READER SERVICE CARD

KEES SOCKET METER COVER



Fits All Standard "S" Type Meters

Made from 16 gauge zinc-coated, rust resistant steel and finished in gray baked-on enamel, the KEES Socket Meter Cover is designed to prevent breakage of glass on socket meters to insure long service in any climate. Outside diam.—8" and depth—5⅝" and over. Metal cover is also reported to minimize damage from excessive current surge due to electrical storms.

Write P. O. Box 786 for Free Electrical Catalogue.

F. D. KEES MFG. CO. *Since 1874*
BEATRICE NEBRASKA

Bashlin's Quality

FOR OVER 30 YEARS
Choice of Experienced Linemen

FULL FLOATING SHIFTING DEE BODY BELT . . .

Bashlin Quality again is outstanding in this "safety first" body belt. Comfortable, with tools in easy reach . . . Doubly Safe because Bashlin Body Belts have the additional Nylon Safety Feature.

The Bashlin Quality Line of Linemen's Safety Equipment is complete . . . Buy the best from a manufacturer with Long Proven Experience.

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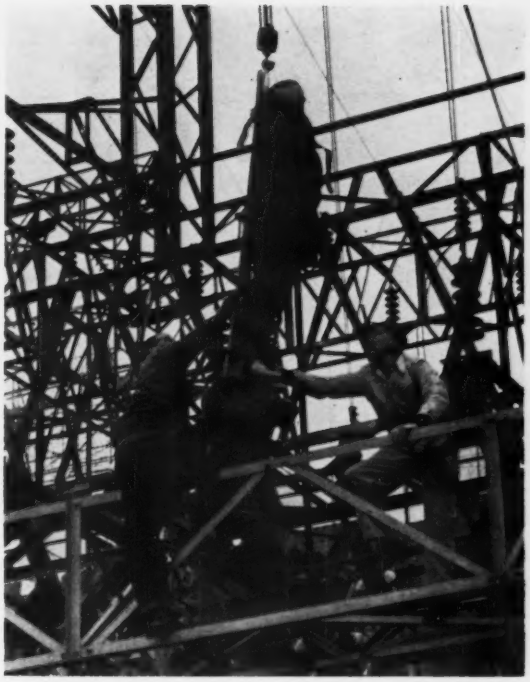
CIRCLE 88 ON READER SERVICE CARD

CIRCLE 93 ON READER SERVICE CARD



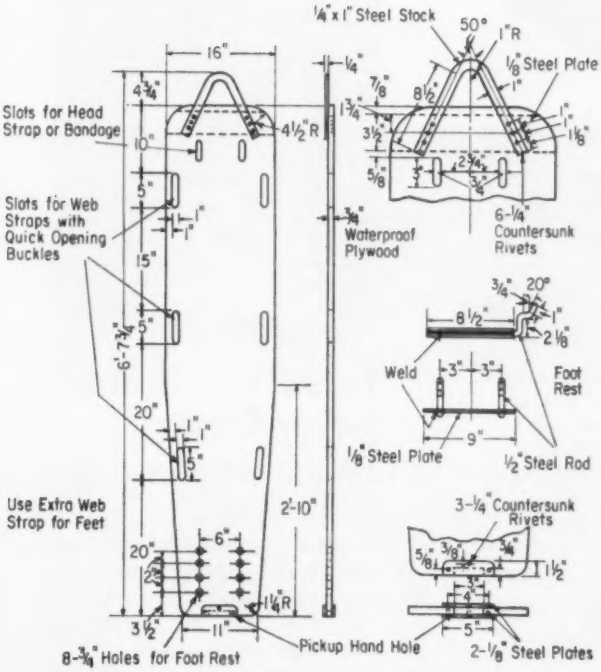
Backboard Carries Collapsed Victim Safely

HOWARD A. GRASSER, Asst Supt, Maintenance & Construction, System Operating Dept, Toledo Edison Co, Toledo, Ohio.

To get a man down from a steel structure when he has collapsed, a solution was proposed by the Toledo Fire Dept rescue squad while instructing the Substation Maintenance and Construction group on standard Red Cross first-aid procedures. As a result, a backboard was made of ¾-in. waterproof plywood. To gain experience with the backboard before an actual emergency arose, a monthly safety meeting at Toledo Edison was devoted to rescuing "victims" from various positions on a steel structure.

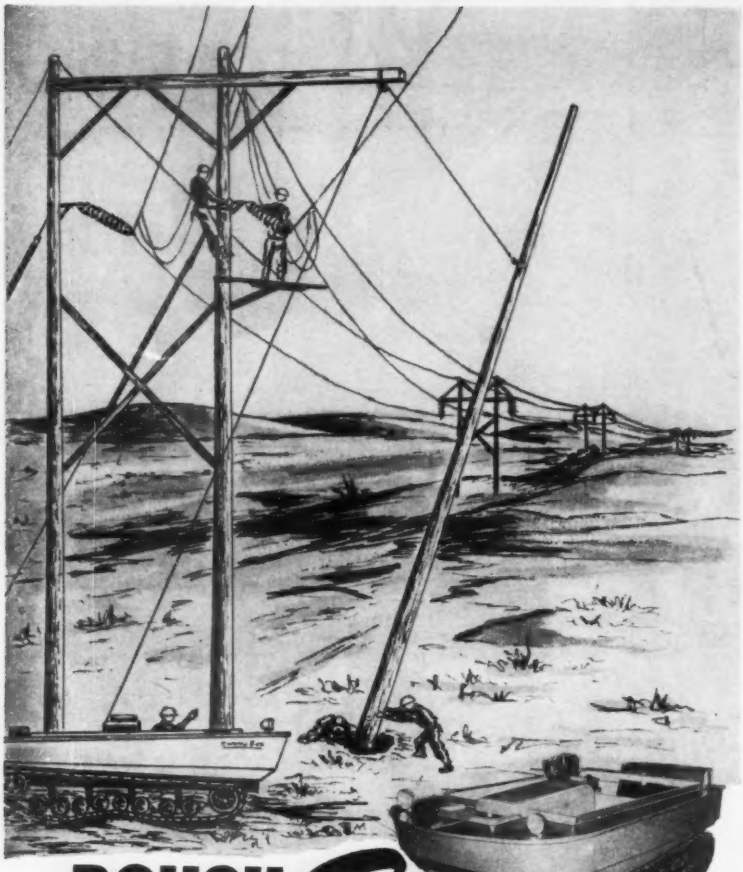
Illustrated are stages of one of the toughest problems encountered that day—a man collapsed inside a box girder. The "victim" on this problem recommends using the combination head bandage and blindfold as shown. Serious shock could result if the injured man regained consciousness in mid-air.

The backboard can also be used for carrying an injured man down narrow stairways and transporting him to the hospital. The backboard is so designed that X-ray pictures can be taken of the patient without removing him to another conveyance. Only the metal foot-rest need be removed before X-rays are taken. This safety device now is standard equipment held in readiness for any tower work by the substation maintenance and construction forces. Black and white prints of the drawing are available upon request.



BACKBOARD made of ¾-in. waterproof plywood is designed so that X-rays may be taken of victim quickly

(More Safety on page 148)



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Swamp Fox...

IT GOES ANYWHERE... Fast!

Rough weather . . in water . . over ice or snow, the Swamp Fox does things anywhere and gets places . . . fast! Only one of its manifold uses is illustrated here. Perfect for construction workers, utility companies, commercial fisheries. The Swamp Fox will carry or haul work loads to remote areas over varying terrain. Get ALL the information on the SWAMP FOX now . . . see how it can save you Manpower — Motion and Money!

For more information write to . . .

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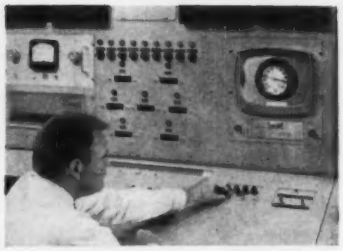
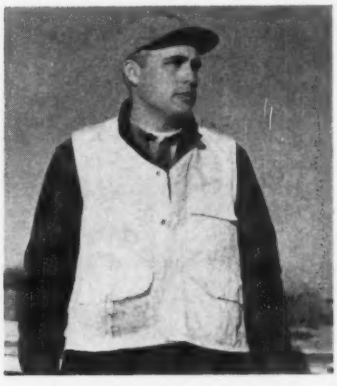
"World's Largest Supply of Weasel Parts"



TV Reads Dials In Nuclear Station

Closed-circuit television extends the sight of reactor plant operators without exposing them to the hazards of radiation. A closed-circuit system at Vallecitos Station provides a means of reading nuclear reactor water levels at the main control console.

The television system consists of a camera, power control, and monitor. A control panel below the monitor allows the operator to tilt or pan the camera, as well as move it up and down or left and right. Vallecitos Station is a joint venture of General Electric Co and Pacific Gas & Electric.



Yellow Vest Guards Survey Crew

A bright yellow vest is worn over regular clothing as a safety measure by survey parties of Niagara Mohawk Power Corp when working on or near highways. Improved "visibility" gives men protection from motorists and helps avoid injuries. The fabric vests were developed by Marshall Goettel, surveys supervisor, Central Division.

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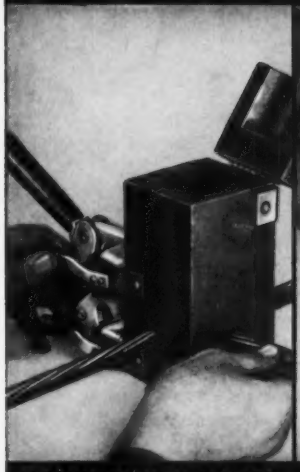
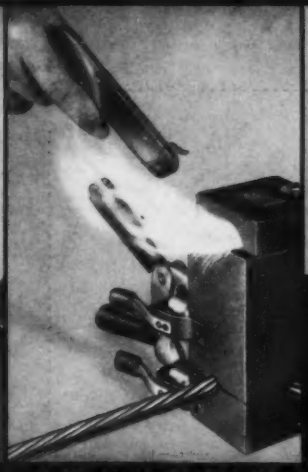
Get a permanent THERMOWELD connection quickly...never corrodes or loosens, costs little to install. Current-carrying capacity higher than conductors.



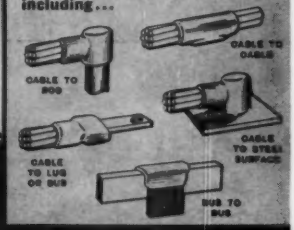
Weld anywhere, to cable or flat, with this compact, lightweight THERMOMOLD. Completely self-contained... needs no external source of power, no special skill.

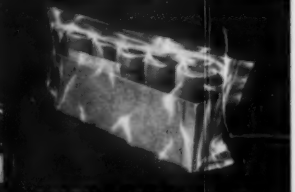
Pour welding powder into mold, tap to release starting charge. Unique composition of starting charge prevents mixing with welding powder, assures positive firing. Slag easily removed.



Close cover and ignite charge with flint gun. Fast-burning powder fires every time. THERMOWELD reaction forms liquid copper which fuses conductors into a solid copper mass.

You can THERMOWELD almost all steel or copper connections, including...





THERMOWELD fires every time. Cartridges sealed in polyethylene envelopes with moisture-absorbing silica gel. Starting, welding charges can't mix...full starting charge assures ignition.

All components are available from your local Burndy distributor. Ask him or your Burndy representative for a demonstration.

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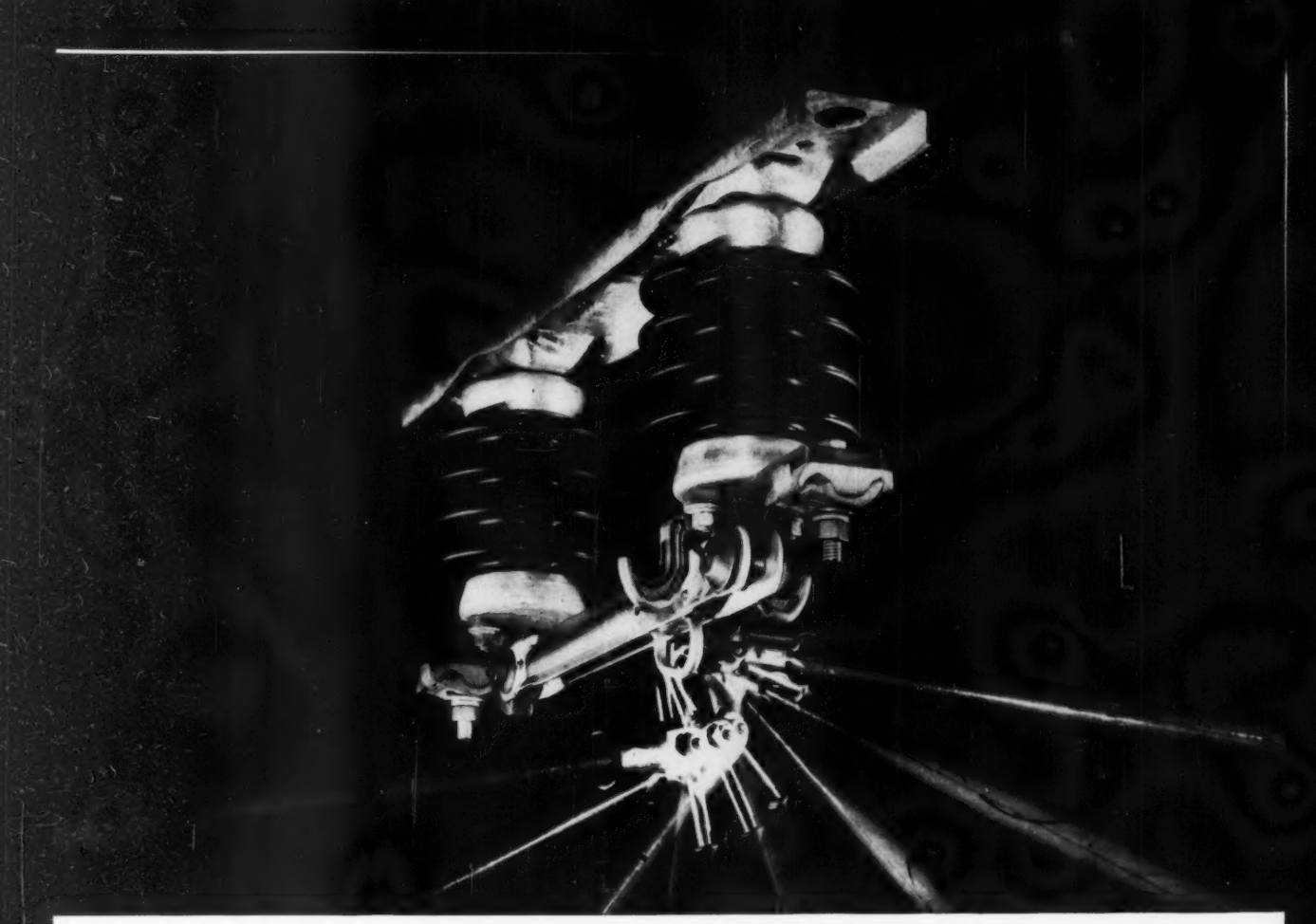
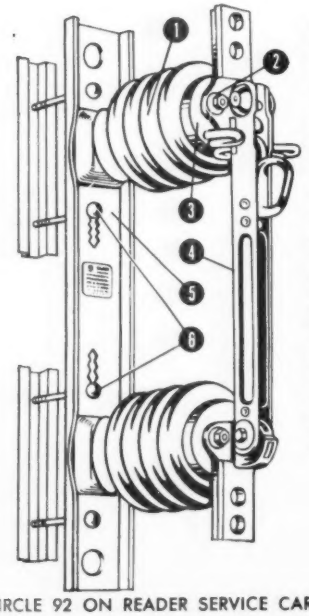


From any angle . . .

this S&C Loadbuster Disconnect can be slammed closed without missing.



1. STURDY INSULATOR. Has 5000 inch-lb. torsion strength. Means it can withstand the most severe twisting stresses when blade is closed from the side

2. TWO-BOLT INSULATORS. Two widely spaced bolts on each insulator cap prevent it and the live parts from rotating.

3. INSULATOR CAPS pressed from 12 gauge steel. Will not yield or deform under load.

4. RIGID BLADE won't bend. Heavy embossing and flaring adds strength and rigidity. Blade guides (which also serve as attachment hooks for LOADBUSTER) help steer blade.

5. HUSKY BASE made of 3/16" galvanized steel. Prevents misalignment and extensive distortion when tightening mounting bolts.

6. 4 BOLTS, 2 BACK-UPS for secure distortion-free mounting on double cross arm.

This tough, rugged distribution disconnect won't twist, bend or loosen no matter how hard or from what angle it is slammed shut. To a lineman, who has to close pole mounted disconnects out on a cross arm, this means fast, positive closing. There is no chance of missing the contact or hanging up. Six of the features that help make this possible are pictured at left.

And with LOADBUSTER®, S&C's portable loadbreak tool, and LOADBUSTER DISCONNECTS, you get reliable, low-cost load switching . . . anywhere on your distribution feeders. LOADBUSTER breaks the circuit with no arc, and with no contact burning.

For more information on LOADBUSTER DISCONNECTS please write for Bulletin 721. S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

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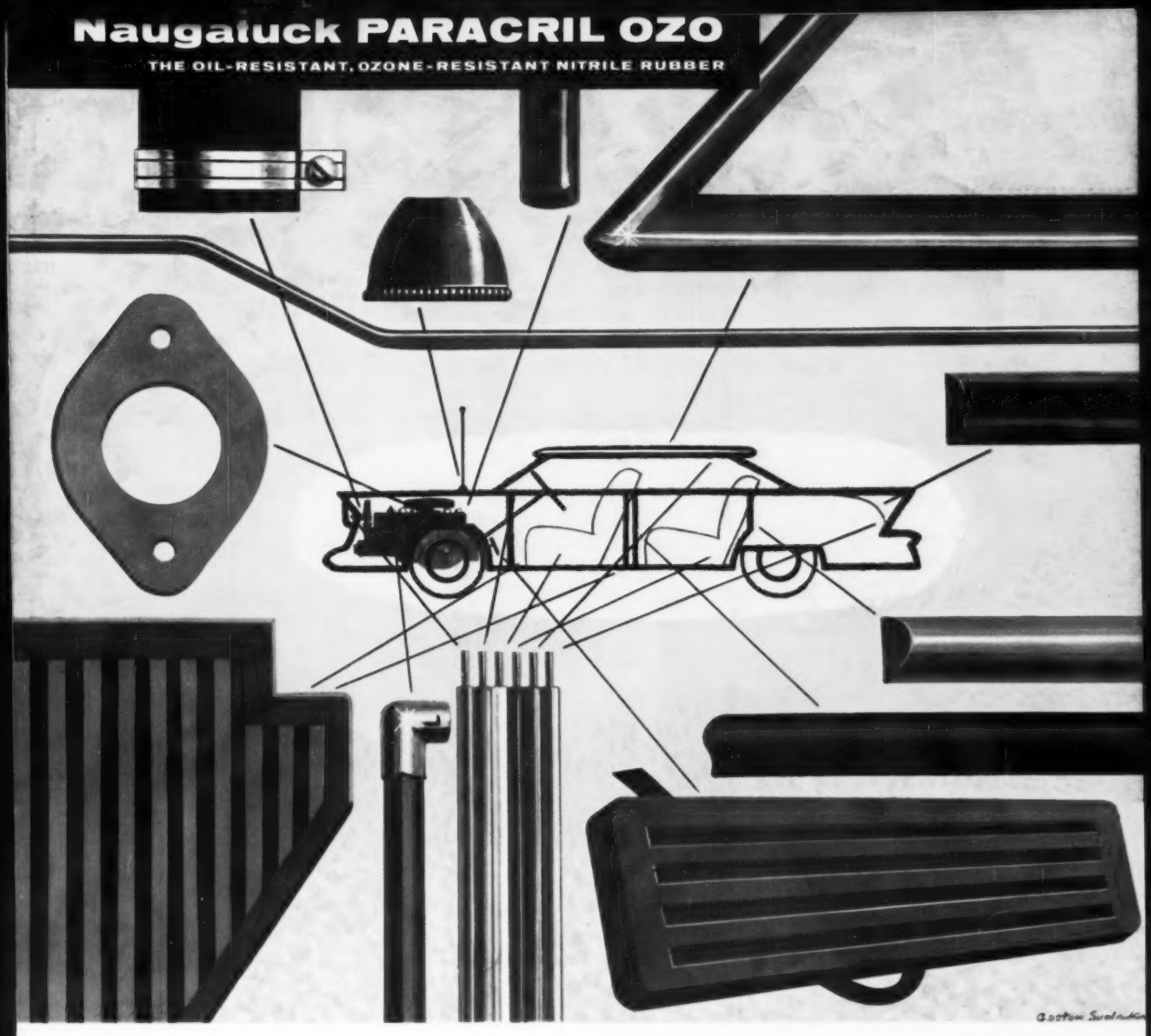

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Here is a new rubber that's unmatched for oil, weather, and abrasion resistance. It's new PARACRIL® OZO, the finest achievement yet in the nitrile rubber field. PARACRIL OZO's properties are tailor made for many modern automotive parts—for everything from weather stripping to oil seals and hose. PARACRIL OZO gives you a whole series of important advantages, including:

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Look into PARACRIL OZO. Discover for yourself its new design possibilities...its unlimited color...its high quality. Contact your nearest Naugatuck representative at the address below.

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short term vs. the long look

No utility is about to lose interest in the invoice price of coal. But as the power needs . . . and the resulting coal needs for the next ten and twenty years shape up in every operating area . . . short term thinking is giving way, more and more, to the *long look.*

Utility engineers and purchasing agents are asking themselves and their coal suppliers some pointed questions: "Can we count on these suppliers to deliver the kind and quantity of coal we're going to need in the years ahead? Have they adequate reserves? Is this coal costing us over and above its invoice price in excessive coal handling, ash handling, equipment outages, freight charges on inerts? Or is it coal that eliminates these frequently overlooked incremental costs, delivers highest operating efficiency and steam at the lowest cost?" The answers you'll get to such questions from Island Creek are the kind that let you plan ahead with confidence. Our engineers would welcome a chance to sit down with yours for a thoroughgoing discussion. Write, wire or phone.

You can depend on Island Creek . . . a career company dedicated to coal

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Precisioneered Coal

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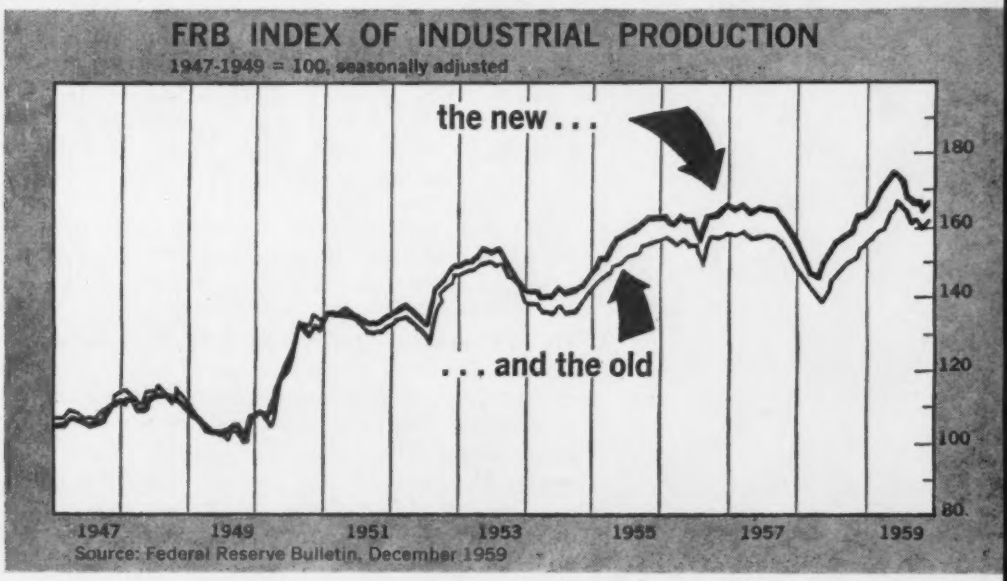


How Fast Is Output Growing?

Report on
Electrical Business Outlook

Industrial production has been accelerating at a faster clip than we realized. In fact, between 1947 and 1959, U.S. mine and factory output grew 4.1% per year, on the average. Not 3.4% per year as the figures had hinted. This hidden growth, just announced, was uncovered when that venerable old prognosticator of industry, the Index of Industrial Production, rolled out of the shop after a periodic overhaul by the Federal Reserve Board. And this surprising undercurrent of growth wasn't all the Fed dragged into the open, McGraw-Hill's Department of Economics observes. When the Fed patched up its old index, the new figures told this story, too:

- **Our postwar recessions were a little more severe** than was generally suspected —but the economy has shown more spunk in its recoveries.
- **Output of materials fluctuated more widely** than the output of finished goods in each of the three postwar recession-recovery periods.

The new index includes utility output for the first time—both electric and gas. **Because of the way the utilities have been growing, that alone accounts for about one-third of the jump you see in the chart above. Most of the remainder can be explained by production estimates that were simply understating output.**

The index measures the physical volume of products that our mines and factories turn out each month. That makes it one of the most closely watched of all the business indicators. But even so, it only accounts for about one-third of our gross national product—the total value of all the goods and services the economy generates. The index omits farm output. And it doesn't include new construction, transportation, retail trade, or services—all of them generous contributers to the dollar flow.

Simply stated, the index is a product counter. It keeps a running tally on autos, cigarettes, generators, machine tools and barrels of oil—to name a very

few. The output of all these goods, and many more, is counted each month. And then this whole array of goods is lumped into the index itself, with the help of some fancy arithmetic.

The output of one cigarette, for example, isn't as noteworthy as the output of one automobile. And both are mere trinkets alongside a Boeing 707. Thus, each product has got to be weighted to show its actual contribution to our economy. And the economists, as you might expect, weigh each according to its price tag, with the total weight for the industrial economy set at 100. The weight awarded the electric power industry, for example, is 3.76—which means it accounts for about 3.76% of total industrial output. Gas got a 1.20 weight in the new index. Some of the heftiest contributors to the grand total: Primary iron and steel, weighing in at 6.21. Cars and trucks—5.04. Electrical machinery—6.39. And non-electrical machinery—a whopping 8.92.

The Fed would have a simple job if it could count each item as it came off the assembly line. Unfortunately, it can't. Almost half of all the figures that it mixes together to make up the index are estimates-output figures for many goods simply aren't available month by month. These output estimates are figured by multiplying man hours worked (a figure the Fed can get its hands on) by an estimate of labor productivity for that industry. The end result is a fair guess at physical output. But it's never more accurate than the estimates themselves, which can only be verified at years-end when manufacturers close their books.

In doing all this the Fed has to avoid double counting. It doesn't measure end-output—it measures value-added output. A nail factory, for example, doesn't get credit in the index for turning out a complete nail. It shares the credit with the steel industry, which supplied one-nail's-worth of steel wire. The steel plants, in turn, share their credit with the iron ore and coal mines, both of which contributed something to the steel itself. And so it goes on a national scale, with each producer getting credit for the value he adds to his product. With that background, what do all the changes in the index mean?

What the New Index Shows

Physical output has grown considerably faster since 1947 than the old index showed. The new index charts a 4.1% per year increase over the 12-year period, compared to 3.4% per year previously. There are two contributing factors. First, the addition of the utilities, which have grown faster than many other industries. Second, the upward revision of the worker productivity figures used for estimating about half the items in the total index. The growth in production was fastest in the early fifties with the pent up demand for consumer goods following WW II; and with the production buildup that started when the Korean War was touched off in June 1950.

The new index has more violent ups and downs. That's because steel, autos and machinery—three items that fluctuate in volume much more than most—are now assigned a higher weight (in value added terms). They have a higher weight because their prices rose faster than those for most other goods in the last decade. This important shift in weights, amplifying the ups and downs, more than offsets the addition of utility output, which tends to damp out the swings in either direction.

The difference in the depths of our recessions and the vigor of the upswings in recovery is significant. The '57-'58 recession was a little worse than we thought. Production dropped 15%—not 13% as we had fancied—between August '57 and April '58. But in the climbout the economy showed more strength—a 26% gain by June 1959, instead of 23%.

Source: Federal Reserve Bulletin, December 1959

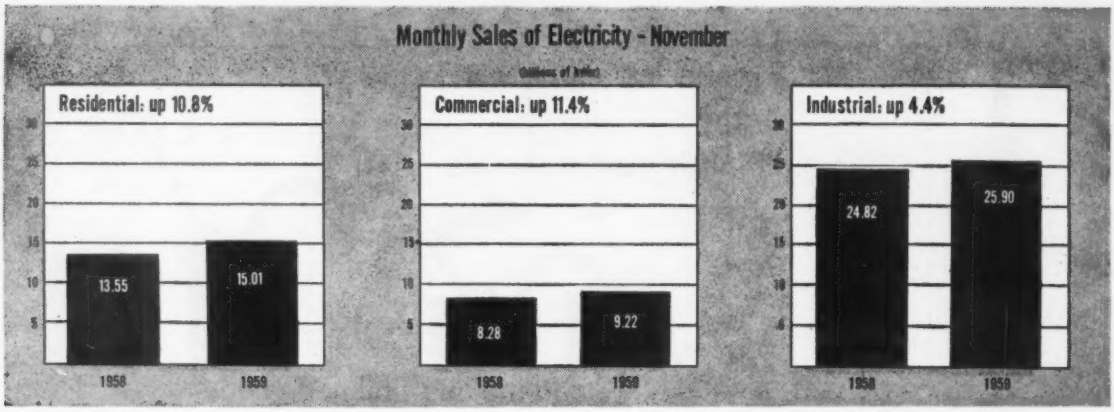
The new index has three new market groupings—consumer goods, equipment, and materials. For that reason we can see what's going on in industry at different levels of manufacture, including changes in inventories. For example, a steel industry analyst could look at the pre-strike output of steel for consumer durable goods and at the actual output of cars and appliances. He could see at once that manufacturers were stockpiling huge supplies of steel. Steel output for consumer durables rose 25% in the first half of '59, while auto and appliance output rose just 10%. The conclusion was obvious.

The new index is a more accurate reflector of industrial activity now that it's been expanded into new fields. The major addition, of course, was of electric and gas output. But 33 other items were added as well, including such diverse products as fluid milk (now considered a processed and packaged item).

There was a complete statistical overhaul, too. The most obvious change was to update the base from 1947-49 = 100 to 1957 = 100. Because of this, the weighting factors were changed to match 1957 price levels as well. These new weights make the index a more accurate mirror of industrial activity, since they reflect the great price changes that have swept the economy in the past decade. The major statistical change, of course, was in the labor productivity scales.

The Fed has been promising to add utility output to its index ever since its last big revision in 1953. Now, with the utilities included, the index is roughly comparable with the production indexes of foreign nations—most of which already include electric and gas output.

And with the utilities included, the new index also reveals a truer picture of fuel output. For example, coal mining, with its downward trend, was fully represented in the old index. But electric output was not covered at all, and natural gas was counted only at the well. It is significant that electric output has expanded much more than fuel output, the Fed notes in the *Bulletin*. Electric output rose 200% between 1947 and 1959—but fuel output rose just 17%. "This difference," the Fed writes, "partly reflects the marked economies achieved in the use of coal, gas and fuel oil in the generation of electricity."



Power Statistics

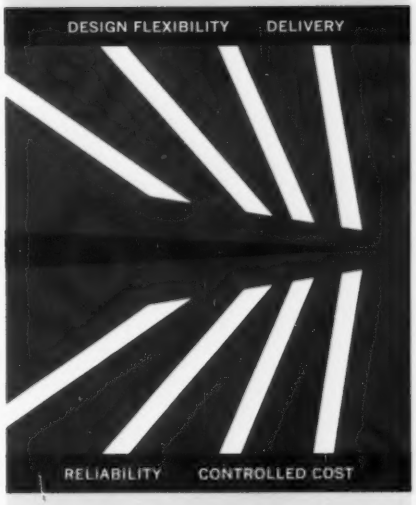
		Latest Month	Year Ago	Annual Change %
Capacity, Est. Dec. '59 Peak, Est. Dec. '60 Peak — million kw	Nov.	155.85	139.19	12.0
Est. Dec. '59 Peak — million kw	Nov.	124.7	127.4	−2.1
Est. Dec. '60 Peak — million kw	Nov.	134.0	136.6	−1.9
Production—billion kwhr	Nov.	58.43	53.89	8.4
Hydro		11.67	10.55	10.6
Fuel		46.76	43.37	7.8
Sales—billion kwhr	Nov.	53.00	49.33	7.4
Residential		15.01	13.55	10.8
Commercial		9.22	8.28	11.4
Industrial		25.90	24.82	4.3
Other		2.88	2.68	7.5
Fuel Consumption	Nov.			
Coal—million tons		14.30	13.50	5.9
Oil—million barrels		7.74	7.62	1.6
Gas—billion cu ft		113.77	101.84	11.7
Net Income Class A & B Co's—$ million	Nov.	135.39	129.64	4.4
Residential Customers—millions	12 mos.	48.86	47.69	2.5
Revenue per kwhr	ended	2.51¢	2.53¢	−0.8
Avg kwhr per customer	Nov. 30	3,562	3,353	6.2
Avg annual bill		$89.41	$84.83	5.4

Business Statistics

Indexes: 1947–49 = 100				
FRB Industrial Production	Dec.	162	149	8.7
ENR Construction Cost	Feb.	170.4	163.3	4.3
BLS Cost-of-living	Dec.	125.5	123.7	1.5
New Orders for Machinery (1950 = 100)	Dec.	164	148	10.8
NEMA Sales				
Insulation materials	Nov.	141	121	16.5
Electric appliances		88	94	−6.4
Wholesale prices				
Motors and generators	Nov.	144.7	146.4	−1.2
Transformers and regulators		149.7	148.8	0.6
Switchgear and fuses		178.6	172.1	3.8
GNP—annual rate—$ billion	3rd qtr.	478.6	444.0	7.8

Significant changes: NEMA's index of appliance sales, after a strong come-back since the recession, touched low water mark in November as the seasonal pre-Yule dip in appliance purchases began. January pickups are usual.

Westinghouse conquers four barriers to economical superload growth



From 160 million kw today to more than 600 million kw in 1980—this is the challenge to America's electric utilities if they are to meet the needs of a mushrooming population and economy.

By 1980, yearly additions alone will equal approximately all the generating capacity installed throughout the first 40 years of this century. Thus, building more and larger machines with controlled costs becomes one of the industry's biggest problems.

Through continuing research and development, Westinghouse is finding answers which can help you plan now to meet future power needs economically.

YOU CAN BE SURE...IF IT'S

Westinghouse

the need . . . bigger, more complex units with high temperatures and pressures

CERTAIN TRENDS ARE EVIDENT NOW. . .

- Maximum unit sizes—presently 500 mw for single shaft and 800 mw for double shaft—are expected to reach 650 mw for the former, and a possible 1250 mw for the latter. Triple shaft designs are now being studied and could push ratings to 1500 mw.
- In 1980, the number of units built per year will increase more than 15% over the number built in 1960, and large unit design will change from tandem-compound two-, three- and four-flow to cross-compound two-, four- and eight-flow.
- The number of turbine elements required for these complex machines will increase by 50% every 10 years.
- The increasing number and complexity of machines will probably triple the engineering effort needed to build them by 1980.
- Steam conditions—temperatures and pressures—as high as 6000 psi at 1200°F are possible.

These anticipated generating conditions, through which the huge power demands will have to be met, present economic problems which might, at first glance, seem insurmountable.

IN ORDER TO MEET FUTURE POWER NEEDS ECONOMICALLY, MANUFACTURERS OF GENERATING EQUIPMENT WILL HAVE TO . . .

1. Achieve design flexibility, superior engineering and improved manufacturing techniques for a wide range of turbine designs.

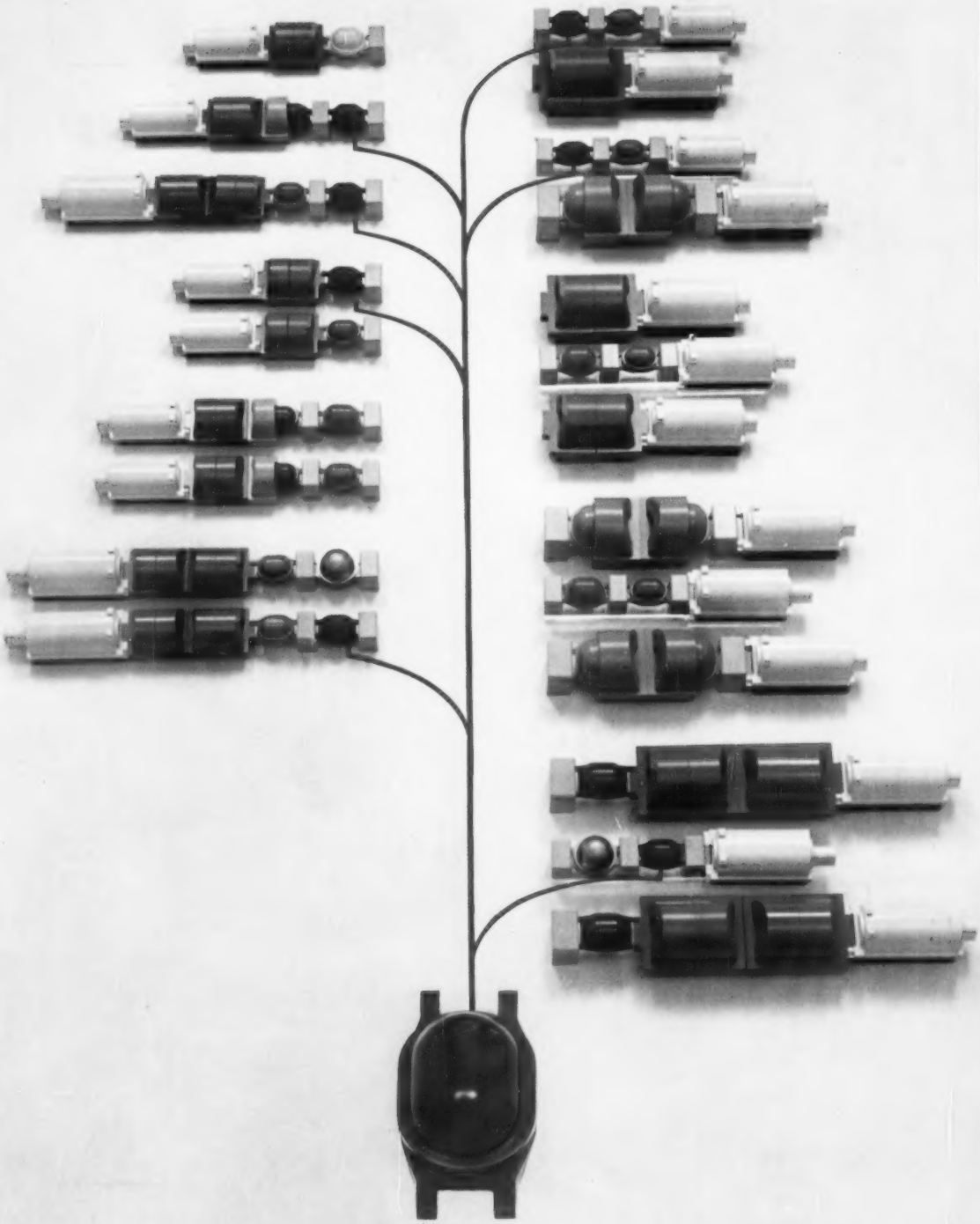
2. Provide shorter schedules for engineering data, for plant studies and for delivery of equipment.

3. Design and build high reliability machines.

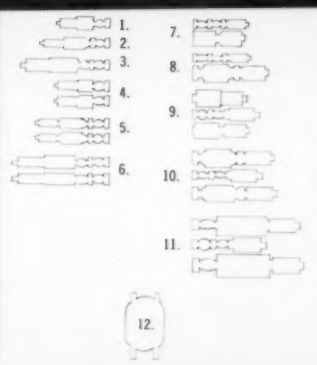
4. Control costs while unit sizes and complexities increase.

Westinghouse, already builder of the world's largest tandem-compound turbine-generators, now offers a solution to the economic problems of designing and building this superload growth equipment — the principle of *integrated components.*

YOU CAN BE SURE...IF IT'S Westinghouse



integrated components save time, man power, money . . . give you design flexibility



3600 RPM

1. Tandem-compound two-flow
2. Tandem-compound three-flow
3. Tandem-compound four-flow
4. Cross-compound four-flow
5. Cross-compound six-flow
6. Cross-compound eight-flow

3600/1800 RPM

7. Cross-compound two-flow (single case LP)
8. Cross-compound two-flow (two case LP)
9. Triple shaft cross-compound four-flow (single case LP)
10. Triple shaft cross-compound four-flow (two case LP)
11. Triple shaft cross-compound eight-flow
12. High pressure element

Since time is a critical factor in meeting future power needs economically, the possibility of using turbine element similarities (the philosophy of interchangeability) wherever efficiently and economically practical offered a natural solution to Westinghouse designers.

After careful study of the types of machines needed in the future, Westinghouse engineers noted that any type could be built from a combination of 10 basic elements.

Combinations of 3600- and 1800-rpm elements (see opposite page and above) can be arranged to produce single, double and triple shaft units. 3600-rpm elements can be made up in tandem-compound two-, three- and four-flow machines and in cross-compound four-, six- and eight-flow machines. Increased ratings can be produced by adding higher pressure and temperature front ends to a combination of the 10 elements that make up the three basic machine arrangements.

MANY BENEFITS

By utilizing the interchangeability of these elements, Westinghouse can deliver top efficiency in the shortest time.

- Unnecessary repetition of design and manufacturing engineering is eliminated.
- Machines can be designed and built more quickly.
- Reliability is increased through specialized and concentrated manufacturing experience.
- Costs are controlled—only design modification of elements is necessary.
- Creative man power is freed from solving repetitive problems to develop greater advances and efficiencies.

Coupling these factors with a more uniform heat balance arrangement and basic plant design practice permits the utility to have a well-planned program for adding huge blocks of capacity with a maximum of economy, at highest efficiency.

This typical Westinghouse unit uses advanced design integrated components. With a capacity of 325 mw, this 3600-rpm tandem-compound, four-flow, reheat turbine utilizes an opposed-flow high pressure element, a double-flow intermediate pressure element, and two double-flow low pressure elements. These same elements can be used to build a cross-compound four-flow unit.

YOU CAN BE SURE...IF IT'S Westinghouse

integrated components lead to greater generator requirements

YET WESTINGHOUSE IS ABLE TO MATCH GENERATORS TO ANY TURBINE OF THE FUTURE

Current research into metals, new excitation systems, and many other advanced materials and methods, makes it possible *now* for Westinghouse to build generators for any turbine of the future. Two basic breakthroughs—Inner-Cooling and Thermalastic®—have been responsible for today's high capacities, and have opened the door to tremendous future developments.

PRESENT DEVELOPMENTS LEAD TO HIGHER CAPACITIES, LOWER MAINTENANCE

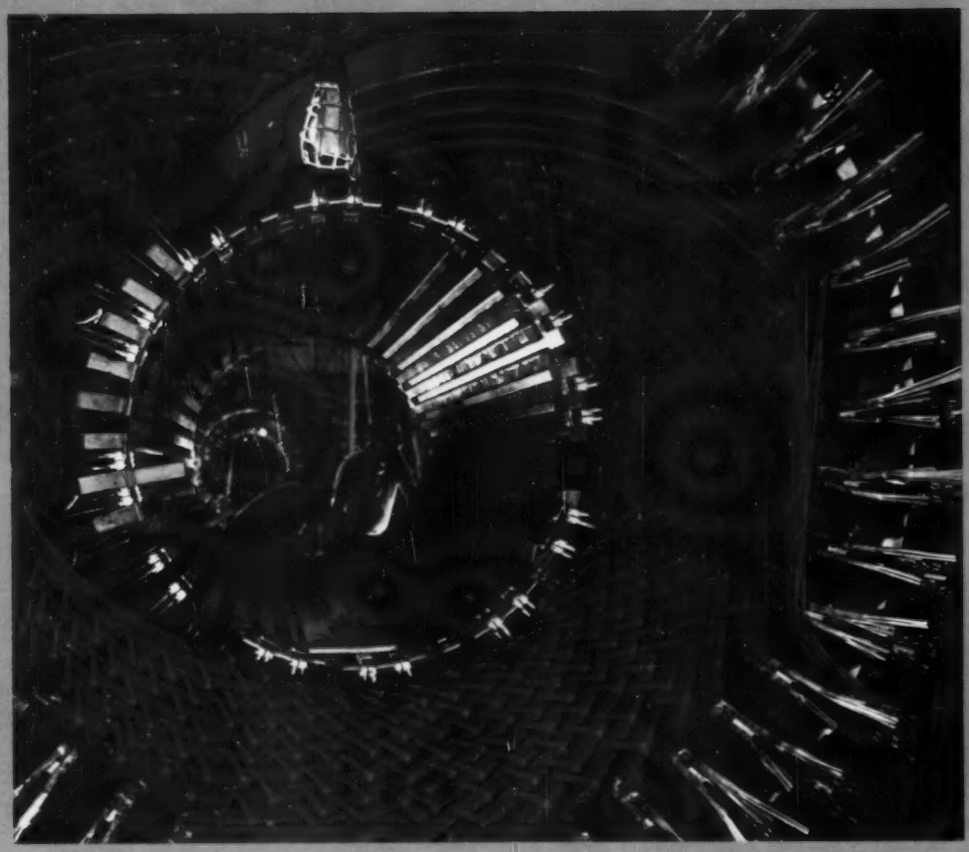
The search for better steels, particularly forgings, is resulting in the development of new alloys and compositions to give maximum strength with suitable ductility. Westinghouse scientists are working with forging suppliers to perfect further advancements in forging techniques, such as vacuum pouring which excludes hydrogen and other gases, and results in improved forging quality.

Other projects, which will be detailed in later advertisements, include research into impurities, electrical sheet steel with better magnetic properties in all directions, even better Thermalastic Insulation, new ideas in excitation systems and a host of other developments.

The research and practical study in Westinghouse laboratories will prove vital in helping you meet your future power needs economically.

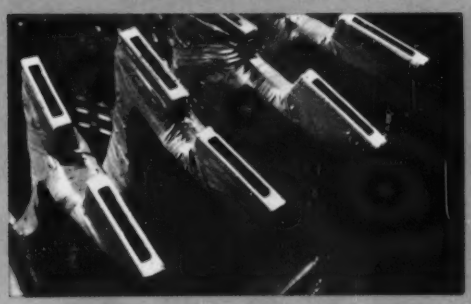
YOU CAN BE SURE...IF IT'S

Westinghouse



Inner-Cooling, developed by Westinghouse and now a standard feature of all Westinghouse generators 160,000 kva and above, circulates hydrogen through the rotor and stator windings, providing intimate contact with the conductors where heat originates. Inner-Cooling allows ratings of single shaft units to triple over conventionally cooled units and greatly reduces size and weight of equipment.

Thermalastic Insulation — the "insulation with a memory"—has a unique molecular structure which permits expansion and contraction of the windings without injurious deformation throughout the life of the machine. Operating voltages cannot get through the fish-scale barrier of mica splittings, which are locked in a memory-type elastic bond.

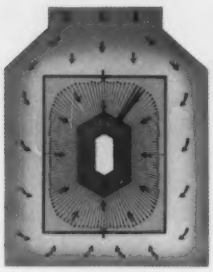


condenser design flexibility means highest efficiency with any combination of turbine elements

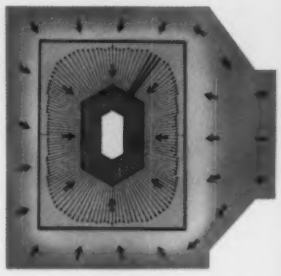
EXPERIENCE AND COMPLETE LINE OF AUXILIARIES PERMIT BEST DESIGN AT LOWEST COST

The design flexibility of Westinghouse condensers makes it possible even today to fit them to tomorrow's turbine-generator units with maximum efficiency.

Westinghouse condensers are readily adaptable to any turbine exhaust configuration. Exclusive Radial Flow Design permits the exhaust steam to completely envelope the tube bundles at any point of steam inlet.

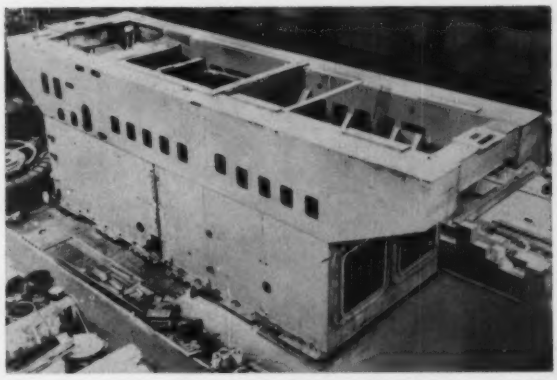


Down Flow



Side Flow

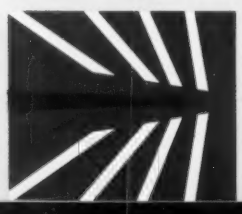
This adaptability, plus a wide range of pumps and auxiliaries, allows for a unified design that gives the highest efficiencies at the lowest cost in a variety of differing installation requirements.



This installation shows Westinghouse condenser design adaptability. The 80,000-sq-ft condenser shown here was designed—for reasons of space limitations—to support completely the full weight of a 135,000-kw turbine-generator.

Research for the future is proceeding in heat transfer apparatus as well as in turbines and generators. Future reports will go into detail on present developments in the full line of Westinghouse generating equipment, all designed to help you meet your future power needs economically. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-50610

YOU CAN BE SURE...IF IT'S Westinghouse



Call Elected President of Missouri Utilities

CALL

WALTZ

Ray W. Call has been elected president of Missouri Utilities Co. He succeeds Harry B. Newman who has retired after 37 years of service. T. F. Waltz Jr has been named vice president and assistant secretary.

Call, an electrical engineer, joined Missouri Utilities in May, 1946, as production engineer. He had been with Texas Power & Light Co. In 1950, he was named superintendent of production and engineering. He was made vice president in charge of operations in 1953, and became executive vice president in 1958.

Waltz has served as assistant secretary and assistant treasurer since 1950. Prior to joining Missouri Utilities in 1949, he was on the staff of the Public Service Commission of Missouri.

Brown Named VP of Gulf States Utilities

Harold E. Brown has been named a vice president at Gulf States Utilities Co.

An electrical engineer, Brown began his utility career with the Tampa Electric Co in 1925. In 1937 he joined the Gulf States organization as superintendent of distribution in the Navasota, Texas, division.

In 1942 he was named operating superintendent of the Lake Charles division, and, in 1953, transferred to Beaumont as system operations manager.

He was later transferred to Baton Rouge as division manager, the position he held until his election as vice president.

Radio Corp of America Names Four Vice Presidents

ANDERSON

FOSTER

CHANE

HOLSTAD

Radio Corp of America has made some top-level staff appointments. Ewen C. Anderson has been named executive vice president, staff; E. Dorsey Foster, vice president, plans and programs, industrial electronic products; George W. Chane, vice president, finance and administration; and Leonard S. Holstad, vice president, electronic data processing service.

Anderson, who directed public relations, joined RCA in 1922. Foster joined RCA in 1951. He was general manager, RCA Electronic Data Processing Division. He will be succeeded by D. H. Kunsman.

Chane had been vice president, finance and management engineering since January 1959. Holstad had been director of management engineering studies.

(*More News About People on p* 170)

Another Utility Installs...

POWERIGHT PARANITE®

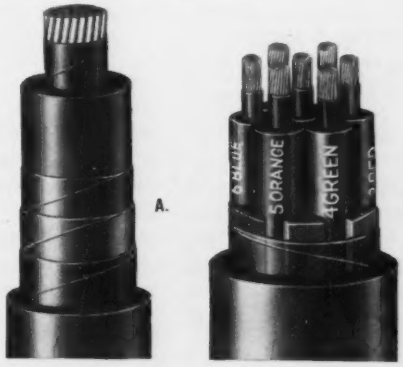
POWER CABLE

A modern electronic computor system at South Bend, Indiana, is serviced by Paranite Super-Pararite® Paraprene® network cable installed by the Indiana & Michigan Electric Company. Three Paranite network cables were laid parallel in underground ducts from the primary circuit to the new I B M building.

From 600 V. network through 28,000 V. power cables, Paranite has proven its dependability in coast-to-coast power installations. Paranite's engineering department invites your inquiry on specific problems relating to your application.

PARANITE WIRE & CABLE PRODUCTS
WIRE AND CABLE DIVISION
ESSEX WIRE CORPORATION, Marion, Indiana
MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.
Sales Offices and Redistribution Warehouses in all Principal Cities

This recently completed IBM Branch office at South Bend, Indiana, handles the load of Data Processing Machines servicing nine counties in Northern Indiana and Southern Michigan.



A. Paranite HIGH VOLTAGE CABLES are manufactured in a complete range of sizes—1000 V. through 28,000 V. single conductor, 3000 and 5000 three conductor. Adaptable for aerial, direct burial or underground duct installation, wet or dry location.

B. Paranite CONTROL CABLES are produced in a complete range of insulation and jacket types. Rubber, PVC or Polyethylene insulations are available to meet a variety of service temperature conditions.

Frank G. Smith Jr has become administrative assistant in the executive department of Mississippi Power & Light Co. **Joe H. Box** has become director of area development and **C. Lamar Stephenson Jr,** division manager of the Western Division. **Norris Stampley** transfers to the central division as assistant to the division manager.

Louisville Gas & Electric Co's **W. I. Lukenbill,** a vice president, has retired.

Duke Power Co has promoted **Monroe C. Ward** to supervisor of line maintenance for the Greenville district.

E. H. Will, chairman of the board of Virginia Electric Power Co, has been honored by the Wall Street Journal as an outstanding executive.

Union Electric Co has appointed **Wayne E. Phillips** residential lighting advisor, and **Robert X. Weidenbenner** assistant to the plant superintendent at Ashley Plant.

Donald T. Faust has been appointed assistant to the vice president, division operations, of the West Penn Power Co.

C. W. Beringhaus, electrical engineer, general engineering department, Cincinnati Gas & Electric Co, has been assigned to the Enrico Fermi Power Plant which CG&E and 51 other companies are constructing near Detroit, Mich.

Duquesne Light Co has appointed **William G. Dempler** system planning engineer in charge of the system planning department, and **C. H. DeWitt** manager of the budget coordination department of the Fiscal Division.

Abitibi Power & Paper Co has appointed **E. E. Grainger** manager, Woodlands. **Clark B. Davis,** vice president, has retired.

Richard P. Mortell has been promoted from assistant operating manager to manager of operations by Puget Sound Power & Light Co. **Willard A. Gallotte** becomes manager of engineering; **F. H. Ferguson,** planning engineer; **J. J. Dempsey Jr,** standards and methods development engineer; **Pat F. Hargreaves,** electrical engineer; **Lyman M. Chitty,** land and right-of-way engineer; and **Elwood C. Avery,** project coordinating engineer.

Wisconsin Electric Power Co has named **Russell W. Britt** to the newly created post of assistant controller.

Lee B. Hertzberg has been appointed supervising engineer of the East Bay Municipal Utility District's mechanical and electrical design section, succeeding **Leslie Paul** who retired after 38 years with the district.

Edward A. Rudulph has been made manager of Union Electric Co's Taum Sauk "pumped storage" electric power project.

Joseph A. Maguire has been appointed manager of the Commercial Accounting Division at Central Hudson Electric & Gas Corp.

Central Illinois Light Co has named **Claire Crabill** suburban district manager. **L. A. Swanson** will replace him as Peoria Division sales manager.

D. M. Pritchett has been appointed to the newly created position of assistant to the president, California-Pacific Utilities Co.

Oklahoma Gas & Electric Co has made these key assignments: **Wayne A. Parker** to assistant superintendent of construction; **Haskell E. Carpenter** to Western Division superintendent; **Roy Lappin** to supervisor of lines; and **J. C. Lamb** to superintendent of payrolls.

Charles E. Filbin has been promoted to residential sales director for Pacific Power & Light Co.

Montana Power Co has made **R. A. Neill** assistant vice president.

Potomac Edison Co has named **George W. Martin** general foreman of the line department.

Public Service Electric & Gas Co has promoted **Morris D. Hooven** to consulting engineer in the electric engineering department.

Virginia Electric & Power Co has appointed **Elmer B. Hurst** safety director, succeeding **Ernest C. Bookman** who retired.

J. M. Stedman, former general sales manager, Pennsylvania Power & Light Co, recently returned from Panama where he was engaged as senior consultant in the development of commercial programs and organization, cooperative promotion utility trade programs in operating areas of American & Foreign Power affiliate. He now is established in consulting services in sales and industrial development, trade and public relations to utilities, manufacturers and industry groups.

Paul J. Raver has been re-appointed superintendent of Seattle Department of Lighting.

Virginia Electric & Power Co has named **Thomas S. Martin Jr** manager-system planning, engineering and construction department, and **Eugene R. Crutchfield,** superintendent-system operation, power department.

Arizona Public Service Co's corporate group has been reorganized. The new organization now provides for four departments within the group. **W. E. Mueller,** assistant secretary and assistant treasurer, will continue as manager of the general corporate services, and **Ralph Thompson** continues as manager of insurance and claims services. **George W. Green** has been appointed manager of the new stockholder services department, and **Larry Mills** will manage the new department of corporate contracts and records.

Frances McGovern has been appointed a member of the Ohio Public Utilities Commission. She is the first woman to hold that office. Miss McGovern, a member of the 1957 Legislature, had been appointed to the commission last year but was ineligible to serve until one year after the 1957 legislative term

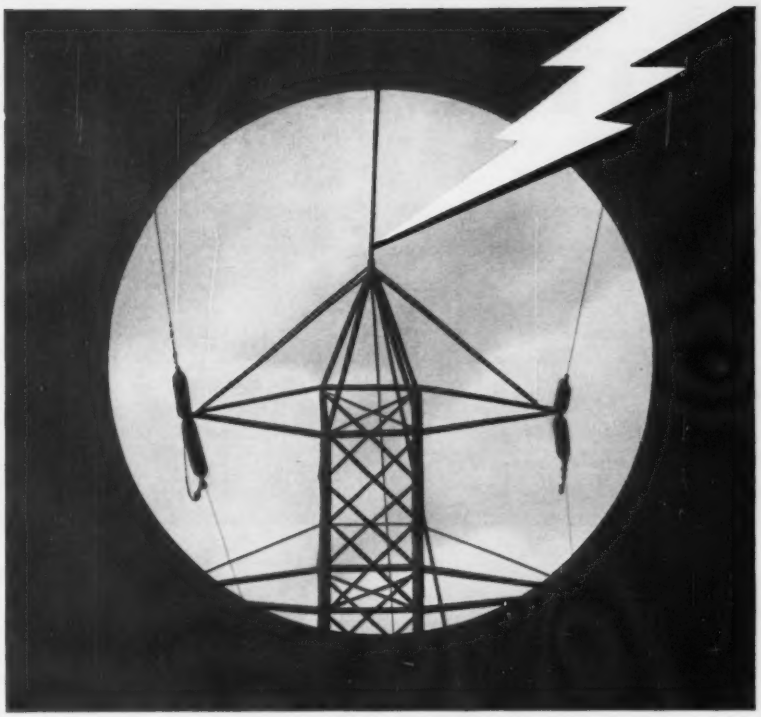
ended. This was because while she was a member of the Legislature when it increased the salary of PUCO members.

Herbert O. Anderson, former vice president in charge of sales for Rockbestos Wire & Cable Co, has retired.

Westinghouse Electric Corp has made the following appointments to its apparatus products group: **Chris H. Bartlett,** deputy general manager of the East Pittsburgh division; **A. L. Shepler,** assistant to vice president and general manager, apparatus products; **L. C. Berger,** group director of management services in Pittsburgh; **James M. Wallace,** assistant manager of Manufacturing and Repair Divisions; **A. J. Petzinger,** manager of the Meter Division; **R. W. Lang,** manager of the Meter Division's instrument department. Other appointments at Westinghouse: **Standish H. Harrison** as Pacific Coast region marketing manager for the Apparatus Division; **D. Santini** as engineering manager of the Elevator Division; and **E. B. Dawson,** who will retire later this year, to the position of consultant to the Elevator Division vice president. **Dr Edgar A. Sack Jr** manager of the dielectric devices section at Westinghouse's research laboratories, has been chosen "Outstanding Young Electrical Engineer" for 1959 by Eta Kappa Nu Assn.

Philip D. Reed, General Electric Co board chairman from 1939 through 1958, retired recently. He relinquishes duties as a director, finance committee chairman and chairman consultant. He joined GE in 1926, one day before his 27th birthday. A special assignment in marketing has gone to **Henry J. Chanon,** manager of marketing in the outdoor lighting department in Hendersonville, N. C. Other changes at GE: **Walter G. Pree** is the new national accounts manager for mobile communications, communication products department; **Robert A. Giorgi** has been named manager of market development for two-way radio equipment, communications products department; the new manager of advertising and sales promotion for the meter department is **A. E. Lindholm; Loren D. Creede** has be-

(*Continued on page* 174)



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CF&I Galvanized Steel Strand

Galvanized Steel Strand is a proven material for grounding power transmission lines. The wire used in CF&I Steel Strand is subjected to rigid quality controls for overhead ground wire and is carefully galvanized, assuring long-lasting protection against corrosive elements.

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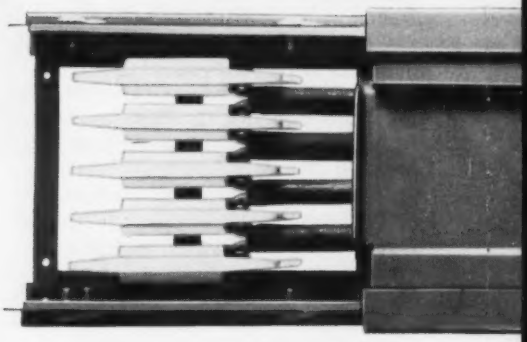
In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

INTRODUCING NEW

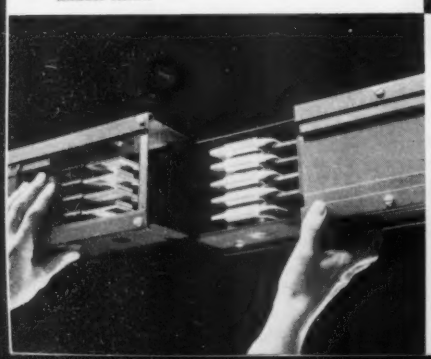


The safest, fastest-to-install plug-in duct ever designed!

Now BullDog, the originators of Bus Duct systems, gives you new safety for plant personnel plus new installation speed and economy with new XL BUStribution duct! Completely Butyl covered aluminum bus bars give true dead-front construction. Crews can now install more duct in a day than ever before. Superior engineering provides low voltage drop . . . down to half that of other plug-in duct systems . . . plus unexcelled short circuit rating. BullDog gives you completely engineered fittings. You can get everything you need from a single source —your local BullDog distributor. Call him—he'll give you a demonstration of all the XL safety and installation features.

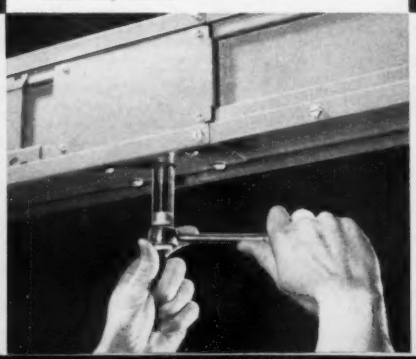
FAST INSTALLATION

Keyed bus ends align themselves positively, instantly, without fumbling or wasted time. You can position sections as fast as you can handle them!



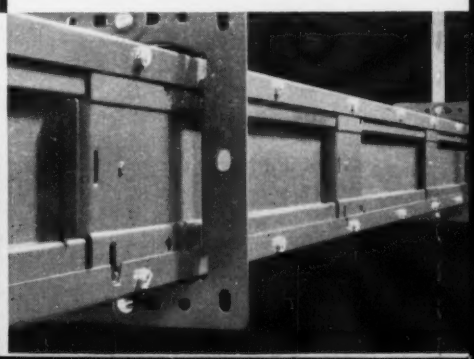
EASY INSTALLATION

This one integral bolt locks POSITIVELY . . . holds keyed bus ends under a ton of pressure. The fully insulated bolt spins tight *fast*. Joints stay locked!



ECONOMICAL INSTALLATION

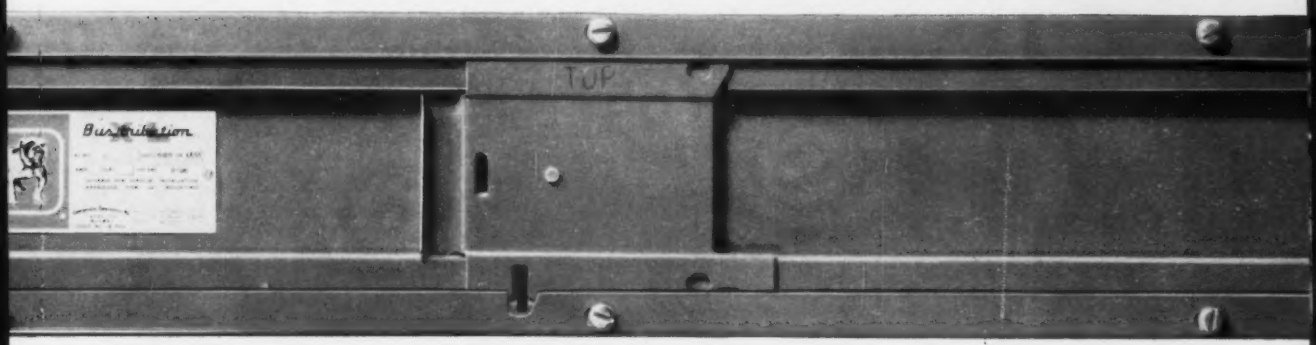
You need only half as many hangers as usual. Ten-foot supporting spans cut number of hangers *and the time needed to install them* by 50%.

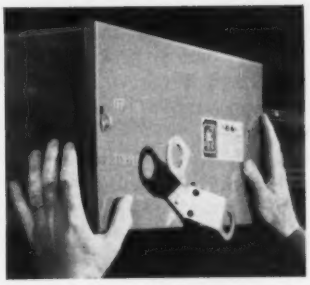


BULLDOG

XL

BUStribution® DUCT





The new **XL SAFETY-PLUG** is faster, safer to use than any other plug!

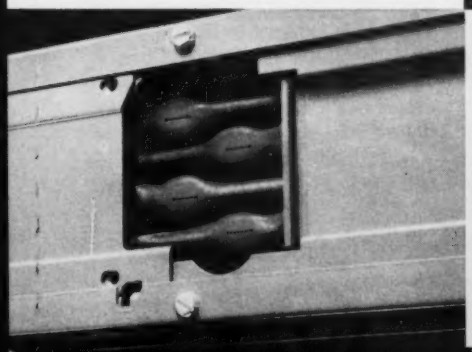
XL Safety-Plug has new, simplified design. You can plug-in on XL duct in seconds. It has safety features not found on any other plug. Plugs are available which prevent installation or removal when plug handle is in the "on" position. You can plug in from either side of the duct, in all duct sizes from 225 through 1000 amps. You can use all plug-in openings at the same time, if desired.

When you see your BullDog distributor about XL duct, examine the Safety-Plug he has on display, too. Here's an electrical team you can depend on to do the job better in every way!

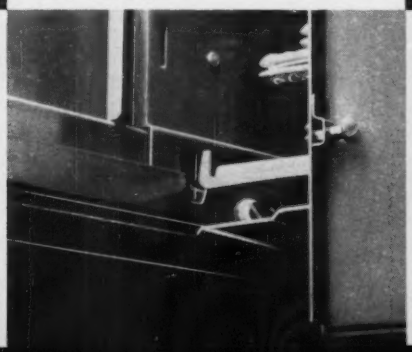
BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayton Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

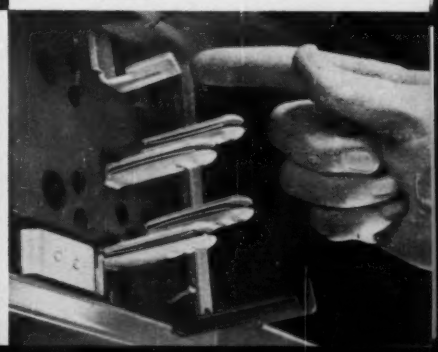
DEAD-FRONT SAFETY
Each bus bar has full-length Butyl insulation, even in bus plug openings. XL BUStribution Duct is the world's safest duct to plug into, to work around.



PERSONNEL SAFETY
Safety door covers the opening . . . slides back when safety interlock finger is in position. Plug cannot be removed or installed when safety door is open.



EQUIPMENT SAFETY
SAFETY PLUGS cannot be installed or removed when in the "on" position . . . exclusive design positively protects against arcing, safeguards equipment.



McGraw-Hill Book News

ELECTRICAL ENGINEERING FOR PROFESSIONAL ENGINEER'S EXAMINATIONS

Complete electrical engineering refresher for all candidates for the Professional Engineer's license. Prepares you for the electrical engineering part of the examination, including detailed material expected of engineers testing for the Electrical Engineer group. Each question is followed by the type of answer expected by examining boards. Covers both theory and practical aspects. **By John D. Constance, Engineering Registration Consultant. 448 pp., 381 illus., $9.50**

ELECTRICAL CONSTRUCTION COST MANUAL

Helps you save time and trouble in estimating electrical construction costs and shows you how to work up more realistic, profitable bids. Develops standard assemblies as a nucleus for unit costing of materials and labor; covers job factors, overhead, and profits; and shows how to bring these factors together in an integrated cost system and estimate. Gives step-by-step procedures for take-off, pricing, and summarizing the estimate, useful graphs, charts, tables, drawings, etc. **By R. E. Johnson, President, Sturgeon Electric Co. 431 pp., 226 illus., $10.00**

HOME WIRING MANUAL

Shows how to meet today's demands for full service, extra capacity, safety, and economy in home wiring systems. Covers methods for determining such essential information as loads, service circuits, and number and type of outlets. Provides a new "three-degree" approach for simplifying the whole job of planning—pointers on low-voltage control—and other aids. **By A. Carl Bredahl, Formerly Technical Services Director, Westinghouse Electric Corp. 221 pp., 97 illus., 38 tables, $4.95**

INDUSTRIAL POWER SYSTEMS HANDBOOK

Provides a wealth of practical, proven data to help you plan and design safe, economical electric power distribution systems. Covers all major phases of industrial power system design with clear explanations of fundamentals and methods, worked-out illustrative examples, and a large variety of helpful data in time-saving table and curve form. **Edited by Donald Beeman, Manager, Industrial Power Engineering, Industrial Engineering Section, General Electric Co. 971 pp., over 500 illus., $15.00**

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☐ Bredahl—**Home Wiring Manual**, $4.95
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come manager of export sales, computer department; **Bernard A. Feldman** has assumed duties as manager of sales planning and promotion for the user industries sales office.

White Motor Co's new chief engineer, White Truck Division, is **E. R. Sternberg.**

Robert W. Dunham has been appointed chief engineer of Square D Co's Molded Case Circuit Breaker Division.

Richard L. Mansur has assumed duties as regional manager of Line Material Industries' newly formed New England region. **Thurman L. Rundlett** has joined the corporation as chief engineer.

S. T. Mackenzie has been named manager of the newly created international sales section of Babcock & Wilcox Co's Boiler Division sales department. **Walther H. Feldmann** has been elected a member of the board of directors.

New power transformer production manager of McGraw Edison Co's Pennsylvania Transformer Division is **Lester R. Stuck.**

I-T-E Circuit Breaker Co has made **Earl B. Rietz** manager of engineering of the Kelman Power Circuit Breaker Division, a newly formed position.

George H. Weaver has become chief engineer of Worksaver, Warehouser and hand lift trucks, Yale Materials Handling Division, Yale & Towne Manufacturing Co. **William W. Olsen** is the new assistant chief engineer in the department. Other appointments: **Norman R. Amberg** to plant manager of the Philadelphia headquarters plant, Yale Materials Handling Division; **John A. Baldinger,** vice president, to direct domestic and foreign materials handling operations, succeeding **Elmer F. Twyman,** senior vice president, who has retired.

George Yeckley is new materials control manager for Anderson Electric Corp. **Charles Phillips** succeeds him as purchasing manager.

Cornell-Dubilier Electric Corp has made **William M. Robinson** chief engineer of paper and film capacitors, filters and pulse-networks.

J. S. Urbanik, division manager of plant operations, has been given managership of the Kaiser Aluminum & Chemical Corp wire and cable works at Bristol, R. I.

International Business Machines Corp has promoted the following division general managers to the new position of divisional president: **Gilbert E. Jones,** Data Processing Division; **William B. McWhirter,** Data Systems Division.

Robert S. Hartman has been promoted to the position of manager, planning and inventory control, at Keasbey & Mattison Co.

OBITUARY

E. Eugene Hawkins Jr, 88, retired president of Patchogue Electric Light Co . . . **Otis Howard,** retired operations manager for the Oklahoma Gas & Electric Co . . . **Charles Herbert Anderson,** former professor of engineering at the University of Kentucky . . . **Robert J. Daniels,** 65, retired general storekeeper of New England Electric System . . . **Samuel H. Libby,** 95, a retired consulting electrical engineer. He also worked for the General Electric Co and Sprague Electric Co . . . **Ralph Irvin,** 73, former manager of the Salmon operations of the Idaho Power Co . . . **Arthur L. Franks,** 90, an electrical contractor and founder of the company bearing his name in Manchester, N. H.

William R. Stone, 56, chief engineer for the Okhahoma Public Service Co's Lawton Power Station . . . **S. Paul Vecker,** retired vice president of Carolina Power & Light Co . . . **Cornelius M. Florer,** 54, head of the Accounting Division of Dallas Power & Light Co's distribution department . . . **Arthur F. Crowell,** 57, manager of First Electric Cooperative Corp, Jacksonville, Ark . . . **Francis V. Cunningham,** 58, Boston representative of General Electric Co's Major Appliance Division . . . **Leslie W. Turner,** 61, designer for Philadelphia Electric Co.

SALES ASSIGNMENTS

COMPANY STAFFS

Westinghouse Electric Corp's Apparatus, Defense Products, and X-ray Divisions are now located in the company's expanded new facilities at 1365 Sixth Ave., San Diego, Calif.

Yale Materials Handling Division, Yale & Towne Manufacturing Co, has appointed Francis O. Boufford, New York branch sales manager.

Thor Power Tool Co has named Robert J. Grace district sales manager in the Chicago branch, and George A. Gambee, district sales manager of the Denver branch. L. J. Hepworth will move from Salt Lake City to San Francisco to succeed Gambee, and R. J. Horrocks from Denver to Salt Lake City to succeed Hepworth as service engineer. M. A. Sorenson will transfer from Denver to the contractor tool division in the Chicago branch. The company's New York customer service branch and sales headquarters has moved to 58-10 Broadway, Woodside, New York.

REPRESENTATIVES

Wesco has named A. P. Equipment Co, Mo., Ferguson-Shiba & Co, Conn., and Ben M. Span & Co, S. C., as manufacturer's representatives for its central, forced air, electric furnaces.

Jackson Products, Air Reduction Sales Co, Mich., makers of arc welding accessories and industrial safety equipment, have appointed Truman J. Baldwin southeastern zone representative.

Radio Corp of America has named the following representatives to the indicated areas: Kacy Communications, Inc, Mo., for eastern and Central Kansas and western Missouri; Electronic Enterprises, Inc, Mo for southern Illinois and eastern and central Missouri; Memco, Inc, Tenn., for western Tennessee; Treece Communications, Inc, Ark., for central and western Arkansas; and Electronic Distributors, Inc, Mich., for five counties in the vicinity of Muskegon.

EEI T&D Committee Meeting (*Continued from page* 70)

The economics of oil circuit reclosers on 12.5-kv circuits are definitely favorable, reported W. L. Carey. This conclusion, however, is not based on a detailed economic study, but because no other way is known to provide high reliability at anywhere near the cost.

The application of oil circuit reclosers as substation feeder breakers, where one interrupting device is compared with another, is not so clear, Carey continued. At best, a recloser may do the job no better than a good circuit breaker, with the possibility of doing a poorer one. In return for this risk, they offer savings of $3,500 to $4,500 per feeder position.

H. C. Bingham outlined Cleveland Electric Illuminating Co's method of checking, testing, and maintaining oil circuit reclosers. CEI feels that its records are adequate for determining whether a single-pole recloser of a group can be coordinated with others in the system. Records cover new reclosers, as well as those in use and being maintained.

A. Gandy Jr, Potomac Electric Power Co, described the relocation of two 69-kv, pipe-type cables under 200-psi oil pressure without cutting the cables. The cables were 6-⅝ in. OD with 2-ft horizontal spacing center-to-center, and had to be moved because of highway improvements.

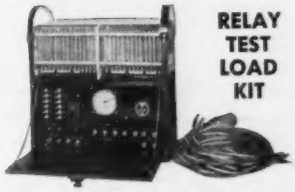
The poles were moved 6.2 ft laterally for a distance of 702 ft, and prior planning made the project much easier and less costly.

Detroit Edison Co has turned to direct-buried fibre duct in its search for economical conduit system to compete with buried cable, said H. R. Nash. The "parkway" system has advantages in that (1) cable can be removed without digging up an entire section, (2) the trench can be backfilled immediately after duct installation, (3) cable can be installed later, thus eliminating trench maintenance costs, and (4) minimizes construction problems.

STATES TESTING EQUIPMENT

FOR TESTING

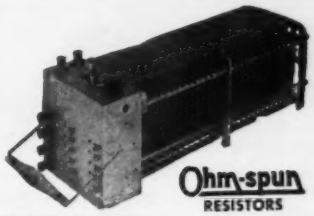
RELAYS



RELAY TEST LOAD KIT

CAT. NO. 33559-R

Compact Kit includes Load, Cycle Counter, Rheostat and Control Switches. Smooth current adjustment from .05 to 58 amperes.

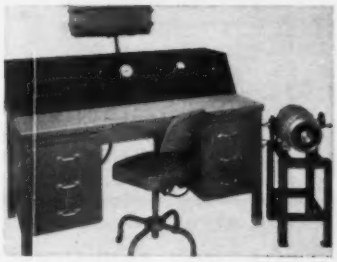


Ohm-spun RESISTORS

TYPE "WR"

In single and double primary and in 30, 50 and 60 ampere capacities.

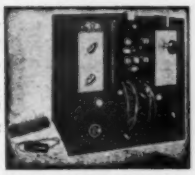
STATES PRESENTS A Wide Range of RELAY TEST TABLES



FORM RFA—Adjustable Current and Potential & Phase Displacement in either 5° steps or continuously.

WATTHOUR METER TESTING

Test tables to provide 50% power factor tests on single phase current. With or without photo electric counters.



CATALOG DATA SENT UPON REQUEST

THE STATES COMPANY

3 New Park Avenue • Hartford, Conn.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE:

EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

——RATES——

UNDISPLAYED RATE:

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

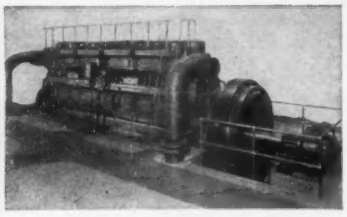
PROPOSALS, $1.80 a line an insertion.
BOX NUMBERS count as one time additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

DIESEL ENGINE GENERATOR SETS

Immediate Delivery from Inventory!



Any voltage; 50 or 60 cycle. Available in stationary, mobile or portable model. Following listing is only partial.

1420 kva Fairbanks-Morse model 38D—8⅛ (photo above)
1375 kva General Motors model 278A
1250 kva General Motors model 567
938 kva General Motors model 567
625 kva General Motors model 278A
625 kva American Locomotive Co. model 539
412 kva Worthington model CC
375 kva General Motors model 268A
312 kva General Motors model 268A
250 kva General Motors model 268A

A. G. SCHOONMAKER Company, Inc.

Foot of Spring St., Sausalito, Cal.
Edgewater 2-1490
50 Church St., New York 7, N. Y. Digby 9-4351

TRANSFORMERS

3—2500 KVA G-E 69000—2300Y
3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—2300Y
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—500 KVA Penn. 13200—120/240
3—333 KVA G-E 66000—2400/4160Y
1—750/938 KVA G-E 3-Ph. 33000—6900Y—TCUL equip. fan cooling
1—1000 KVA W-H 3-Ph. 33000—7200Y TCUL equipped

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

5316 Hetzel St.
Cincinnati 27, Ohio

47 Years' Dependable Service

LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY, INC.
51 Howell St. Jersey City, N. J
OL-3-3334

VALUATION ENGINEER

Management consulting firm has opening on its staff for graduate engineer. Excellent opportunity. Please send resume to:

MIDDLE WEST SERVICE COMPANY
20 North Wacker Drive
Chicago 6, Illinois

WHO'S WHO in —
Electrical Equipment Representatives
Write for free copy of EERA Directory
C. W. SWARD, Executive Director EERA
1675 Fifth St. Clermont, Florida

POWER DISTRIBUTION ENGINEER

The Orlando Utilities Commission, municipally owned by the City of Orlando, Florida, is recruiting for Power and Distribution Engineers. To qualify you must have an Electrical Engineering Degree with power option. Age 25 to 43. Pass physical examination. United States Citizen. Position entails load studies, economic studies, determine equipment requirements, overhead, underground and rural service.

Orlando is a progressive City of diversified industry. It is one of the fastest growing cities in the nation, located in the heart of Florida; a very pleasant, desirable place to live. All replies confidential. Write:

William J. Webeking, *Director of Personnel*
ORLANDO UTILITIES COMMISSION
P.O. Box 3193, Orlando, Florida

ADDRESS BOX NO. REPLIES TO: Box No.
Classified Adv. Div. of this publication.
Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Wanted—Electrical Engineers. Minimum five years experience in public Utility Distribution. Transmission, Metering and Relaying. Required for permanent, responsible positions in Venezuela. Spanish an asset but not essential. Good living conditions. Starting salary of $13,000 per annum. P-3537, Electrical World.

Wanted—Graduate Electrical Engineer. Electric Utility in Eastern Massachusetts. Some experience in transmission and distribution desired. Please answer, giving education, experience and salary expected. Write to P-3628, Electrical World.

Electric Utility Distribution Engineer. Work includes construction, operation and maintenance engineering. Coordination, load and voltage studies, electrical and mechanical calculations and assistance to customers. Salary commensurate with qualifications. Write to P-3515, Electrical World.

Drafting Group Leader—Power Plant Electrical. Competent in supervision of design-drafting for both wiring and physical arrangements. Must be aware of economics of design-drafting and have proven ability to plan and follow through. Career job with engineering level compensation in established Chicago consulting office. Submit two copies of complete resume. P-3672, Electrical World.

Relay Technician with knowledge and experience in testing and maintenance of all types of power system relays. Union wages plus liberal vacation, sick leave and retirement benefits. Dairyland Power Cooperative, La Crosse, Wisconsin.

SELLING OPPORTUNITY AVAILABLE

Representative wanted for manufacturer of street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

SELLING OPPORTUNITY WANTED

Manufacturer's representative desires lines for utilities, jobbers, contractors, and industrials in Northern and Central Illinois, Northern Indiana, Lower Michigan or Wisconsin. RA-3690, Electrical World.

ELEC. ENGINEER REA SYSTEM

IN CENTRAL ALASKA

Requires engr. with first rate utility and admin. experience. Should be versed on REA methods. Salary to $15,000.00 a year. Write to

MANAGER
GOLDEN VALLEY ELECTRIC
758 Illinois St. Fairbanks, Alaska

DON'T FORGET

the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

PROFESSIONAL SERVICES

CONSULTING · CONSTRUCTION · DESIGN · PLANS · EXAMINATIONS · SURVEY · APPRAISALS · REPORTS

AMERICAN AIR SURVEYS, INC.

- Aerial Topographic Maps & Photos
- Plan & Profile for Transmission Lines
- Aerial Stereo-photos for Planning
- Topographic Maps for Reservoir Studies
- Coal Stockpile Volumes by Aerial Method

A NATIONWIDE SERVICE
907 Penn Avenue — Pittsburgh 22, Pa.

BLACK & VEATCH
Consulting Engineers
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Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
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Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Endfield St. — Hartford, Conn.

BURNS and ROE, Inc.
Engineering and Design • Reports • Surveys
Construction • Electric, Steam, Hydro Plants
Transmission • Distribution • Aeronautical
Facilities • Research and Development • Nuclear, Chemical, and Industrial Plants
160 West Broadway • New York 13, N. Y.

COMMONWEALTH SERVICES INC.
Management and Business Consultants
200 Park Ave.
New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design Engineers
200 E. Washington
Jackson, Michigan

DAY & ZIMMERMAN, INC.
Engineers
Design—Construction
Transmission—Distribution Lines
Reports—Valuations—Rates
New York — PHILADELPHIA — Chicago

DOBLE ENGINEERING COMPANY
Electrical Insulation Engineers
Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications
Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr., Chicago, Ill.

GIBBS & HILL, Inc.
Consulting Engineers—Designers—Constructors
Steam, Hydroelectric, Gas-Turbine & Nuclear Power Generation—Electric Transmission & Distribution Systems—Power Surveys, Reports & Contracts—Industrial, Transportation & Communication Facilities—Water & Waste Treatment Works.
Pennsylvania Station — New York 1, N. Y.

The Consulting Engineer

"By reason of special training, wide experience and tested ability, coupled with professional integrity the consulting engineer brings to his client detached engineering and economic advice that rises above local limitations and encompasses the availability of all modern developments in the fields where he practices as an expert. His services, which do not replace but supplement and broaden those of regularly employed personnel, are justified on the ground that he saves his client more than he costs him."

GILBERT ASSOCIATES, INC.
Engineers and Consultants
DESIGN
SUPERVISION OF CONSTRUCTION
BUSINESS AND ECONOMIC RESEARCH
READING, PA.
Washington — New York

HARZA ENGINEERING CO.
Consulting Engineers
Calvin V. Davis — E. Montford Fucik
Richard D. Harza
Hydroelectric Plants and Dams
Transmission Lines
Flood Control, Irrigation
River Basin Development
400 West Madison Street — Chicago 6

HOOSIER ENGINEERING COMPANY
Erection and Maintenance of Electrical Transmission and Distribution Lines
1384 Holly Avenue, Columbus, Ohio

JACKSON & MORELAND, INC.
JACKSON & MORELAND INTERNATIONAL, INC.
Engineers and Consultants
Electrical—Mechanical—Structural
Design and Supervision of Construction for Utility, Industrial and Atomic Projects
Surveys—Appraisals—Reports
Machine Design—Technical Publications
Boston — Washington — New York

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports
for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 8-7778

THE KULJIAN CORPORATION
Engineers - Constructors - Consultants
POWER PLANT SPECIALISTS
(Steam, Hydro, Diesel)
Utility • Industrial • Chemical
1200 N. Broad St., — Philadelphia 21, Pa.

PETER F. LOFTUS CORPORATION
Design and Consulting Engineers
Electrical • Mechanical • Structural
Civil • Nuclear • Architectural
First National Bank Building
Pittsburgh 22, Pennsylvania

CHAS. T. MAIN, INC.
Engineers
Electric, Steam and Hydraulic Projects,
Investigations, Reports, Appraisals
Design and Construction Supervision
Boston, Mass. — Charlotte, N. C.

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design Engineers . . Purchasing Specialists in Financing Accounting and other Operations
231 So. La Salle St. — Chicago 4

SARGENT & LUNDY
Engineers
140 South Dearborn St.
Chicago, Ill.

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street — Abilene, Texas

UTILITIES LINE CONSTRUCTION COMPANY, INC.
Construction and Maintenance
Transmission - Distribution
Electric and Telephone Lines
Consultants
505 York Road — Jenkintown, Pa.

VERNON GRAPHICS, INC.
Mount Vernon, N. Y.
MO 4-7117

VERNON GRAPHICS OF PA. INC.
Norristown, Pa.
Broadway 9-3000

CONSULTING AND SERVICING UTILITIES ON MAPS, RECORDS AND FIELD INVENTORY

The Meetings Calendar

FEBRUARY

National Rural Electric Cooperative Association — Annual Meeting, St. Louis, Feb. 22-25.

California Municipal Utilities Association—Annual Conference, Miramar Hotel, Santa Monica, Feb. 23-26.

Sixteenth Annual National Wiring Sales Conference—Warwick Hotel, Philadelphia, Feb. 25-26.

Pennsylvania Electric Association — Commercial Committee, Pittsburgh, Pa., Feb. 24-25; Taxation Committee, Pittsburgh, Feb. 25-26.

Edison Electric Institute—Residential Electric Heating & Air Conditioning Committee, New York City, Feb. 29-March 1.

Pacific Coast Electrical Association—Business Development Meeting, Hotel Lafayette, Long Beach, Feb. 29-March 1.

MARCH

Southern Safety Conference—Robert Meyer & George Washington Hotels, Jacksonville, Fla., March 6-8.

American Society of Mechanical Engineers—Gas Turbine Power Division & Hydraulic Division, Rice Hotel, Houston, March 6-9.

Fifth National Electrical Industries Show—New York Coliseum, New York City, March 6-9.

• **1960 Electric Meter School**—Sponsored by University of Tennessee and Mid-South Metermen's Association, University of Tennessee campus, Knoxville, March 7-11.

Southeastern Electric Exchange—Accident Prevention Committee Joint Meeting with Personnel Administration Section, King Edward Hotel, Jackson, Miss., March 10-11; Annual Conference, Boca Raton Hotel & Club, Boca Raton, Fla., March 21-23; Directors Meeting, Boca Raton Hotel & Club, Boca Raton, Fla., March 23.

Pennsylvania Electric Association—Purchasing Committee, Philadelphia, March 14; Customer Contact Committee, Pittsburgh, March 16; Street & Highway Lighting Committee, Pittsburgh, March 17; Personnel Practices, Philadelphia, March 24.

National Association of Corrosion Engineers—16th Annual Conference and 1960 Corrosion Show, Memorial Auditorium, Dallas, March 14-18.

• **Edison Electric Institute**—Industrial Relations Committee, Mayflower Hotel, Washington, D. C., March 17-18; Area Development Committee, Atlantic City, March 31.

• **Rocky Mountain Electrical League**—Electric Meter Institute, Engineering Department, Denver University, Denver, March 20-25.

• **Wood Pole Conference**—Oregon State College Campus, Corvallis, March 21-22.

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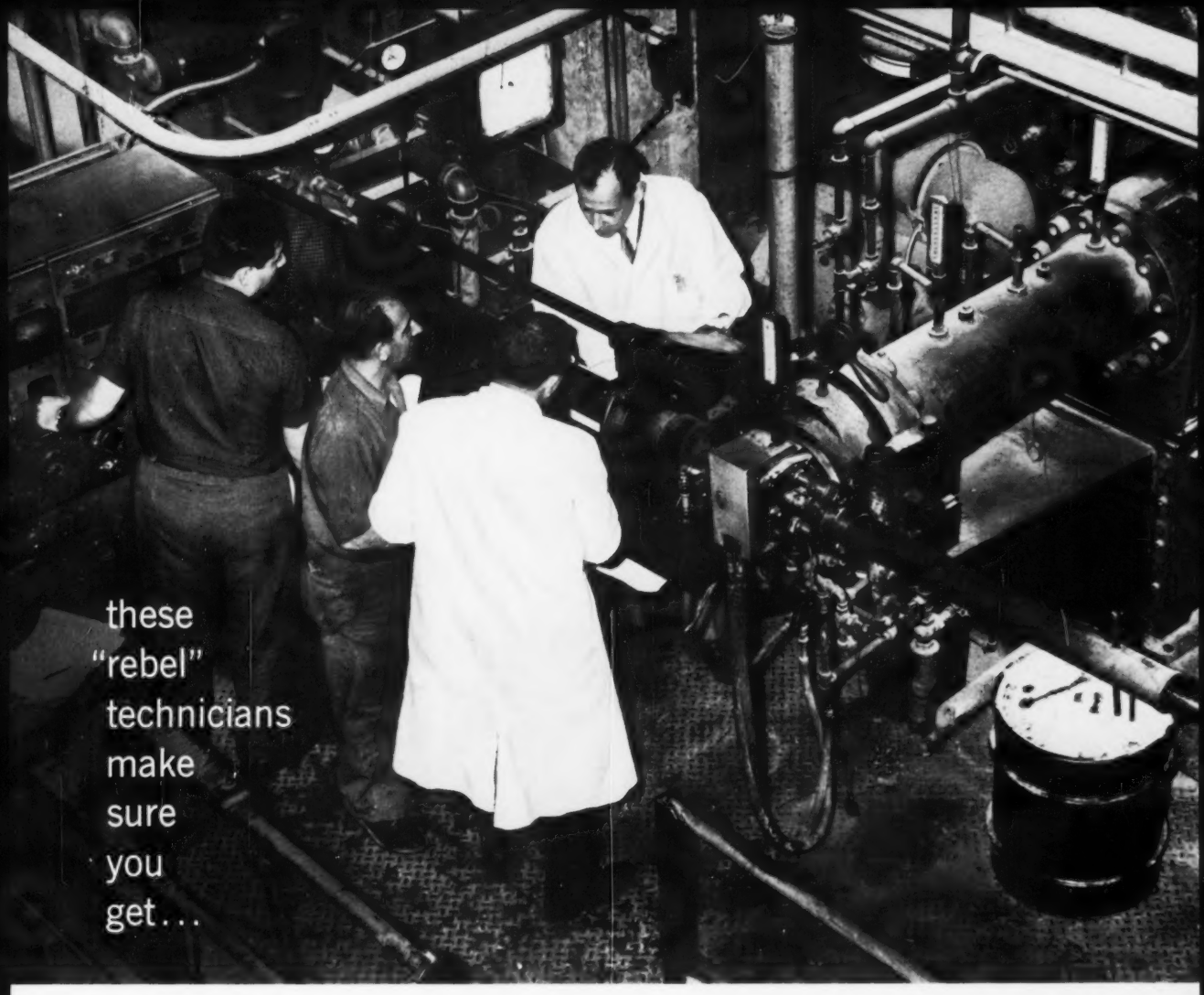


"LABORATORY QUALITY" ON PRODUCTION LINE CABLE

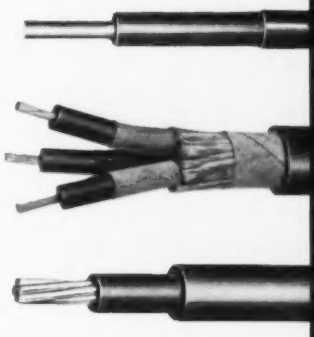
Circle lab men are different. They like to get out in the plant.

Reason: to make sure that the quality they build into a cable in the lab—is all there in the cable you buy.

That's why you'll often find them in the plant working closely with men from process control, inspection and testing. In the photo above, for example, two Circle lab men help check extruder pressure and temperature for a special butyl compound developed for high voltage power cable.

Such close cooperation between laboratory and quality control personnel is unusual in the wire and cable field. It is another reason, however, why Circle products have grown to enjoy their reputation for high quality.

Next time you buy or specify cable, we suggest you ask for Circle. There's no finer cable made.



CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

RUBBER COVERED WIRE & CABLE • VARNISHED CAMBRIC CABLE • PLASTIC INSULATED CABLE • NEOPRENE SHEATHED CABLE • CIRTUBE* EMT

UNIV MICROFILMS INC GS
EDITORIAL DEPT
313 N FIRST ST
ANN ARBOR MICH C 4

Here's a new idea to help you sell electric heat

Electric heating promises to be the electric industry's biggest load builder in the next decade. Advancements in insulation and equipment now make it practical and efficient for any climate.

For the many utilities aggressively promoting electric heating, here's important news: To assist and tie-in with the big job of selling electric heat, Kuhlman offers a new dramatic symbol—a gold transformer to identify electric heating and the all-electric, gold Medallion Home.

The Kuhlman Gold Transformer program ties right into the industry's great drive for electric home heating. It will establish a bright, attractive, easily-recognized symbol that will get the public's attention and approval.

It's backed by a *selling* campaign, with advertising, sales promotion and sales helps to back up the Gold Transformer as a symbol for electric heat.

The Kuhlman representative in your area has all the details you'll want. Call him now!

KUHLMAN TRANSFORMERS
KUHLMAN ELECTRIC COMPANY, Birmingham, Michigan
Manufacturers of transformers since 1894
FACTORIES: Bay City, Mich. • Crystal Springs, Miss. • Salinas, Calif.

LOOK FOR THE GOLD TRANSFORMER, SIGN OF ELECTRICALLY-HEATED HOMES